A taxonomic revision of the many-flowered species of *Trachymene* (Apiaceae) in Western Australia

B.L. Rye

Western Australian Herbarium, Department of Conservation and Land Management, Locked Bag 104, Bentley Delivery Centre, Western Australia 6983

Abstract

Rye, B.L. A taxonomic revision of the many-flowered species of *Trachymene* (Apiaceae) in Western Australia. *Nuytsia* 13(1):193–232 (1999). A key to all *Trachymene* (Apiaceae) species and infraspecific taxa in Western Australia is presented and the 14 many-flowered species are revised. Two sections are recognized here, both requiring new combinations. *Trachymene* sect. *Didiscus* (Hook.) Rye occurs mainly in southern Australia but extends north to the Kimberley region of Western Australia and comprises annual species with simple, usually glandular hairs and primarily blue petals. *Trachymene* sect. *Hemicarpus* (F. Muell.) Rye occurs in northern Australia and comprises perennial or annual species with non-glandular simple or dendritic hairs and primarily yellowish or pink to red petals. The identity of *T. anisocarpa* (Turcz.) B.L. Burtt is established, the new combinations *T. coerulea* subsp. *leucopetala* (Benth.) Rye and *T. grandis* (Turcz.) Rye are made and the following new Western Australian taxa are described: *Trachymene anisocarpa* var. *trichocarpa* Rye, *T. oleacea* subsp. *sedimenta* Rye, *T. pilbarensis* Rye and *T. pyrophila* Rye. Published illustrations are cited and new illustrations provided where required.

Introduction

Trachymene Rudge (Apiaceae) is a genus of about 60 species, distributed from The Philippines south to Tasmania and east to New Caledonia and Fiji, with the majority of species occurring in Australia. The genus is widespread in Western Australia, with ten species occurring in the south-west and a further nine in the Eremean and Kimberley regions, a total of nine species being endemic to the state. A revision of the genus in Northern Territory (Maconochie 1980) covered most of the *Trachymene* species occurring in northern Western Australia and most of the Eremean species were included in "Flora of Central Australia" (Boyland & Stanley 1981). More recently, the few species occurring in the Perth region were described in a regional flora treatment (Wheeler 1987) and most of the Kimberley taxa were included in a flora treatment for that region (Wheeler 1992). Any new taxa encountered in the flora accounts were treated informally, and the main taxonomic problems for the genus in Western Australia remained unsolved as they involved taxa in regions not covered by the floras.

Wheeler (1987: 515) included one south-western species as *Trachymene* sp. A, correctly distinguishing it from *T. anisocarpa*, under which it had previously been placed. The name *Trachymene anisocarpa* has been widely used (e.g. Blackall & Grieve 1980, Curtis 1963, Eichler 1986, Powell 1992 and Willis 1972) in southern and eastern Australia for various *Trachymene* species that were included under the illegitimate name *Trachymene australis* Benth. in "Flora Australiensis" (Bentham 1867). True *T. anisocarpa* is endemic to south-western Australia. The name has been misapplied to a few other south-western species, which can be readily distinguished when in mature fruit but not so easily from flowering material. One factor that has hindered recognition of the taxa is that most specimens, including the type of *T. anisocarpa*, lack mature fruits.

In eastern Australia, at least two species are currently recognized among the taxa previously combined under Bentham's *Trachymene australis*. One of these, *T. bivestita* (Domin) L.A.S. Johnson, is restricted to Queensland. The other occurs in South Australia, New South Wales, Victoria and Tasmania; it is listed as *Trachymene* sp. in Jacobs & Pickard (1981) but is referred to as *T. anisocarpa* in the most recent floras and checklists. While it is not certain whether the latter taxon is a single species or a complex of species, at least some of the eastern material previously included under the name *T. anisocarpa sens. lat.* should be known as *Trachymene composita* (Domin) B.L. Burtt, a name that has not been used because of confusion over the identity of *T. anisocarpa*. However, Domin (1908) adequately described the differences between this taxon and the Western Australian taxa, which have more narrowly divided leaves and monocarps less compressed on the margin. The western and eastern taxa currently known as *T. anisocarpa* also appear to differ in chromosome number, with true *T. anisocarpa* being diploid (Keighery 1982b) and the eastern material tetraploid (Wanscher 1933) or hexaploid (Constance *et al.* 1971), but more counts of eastern material are needed.

Some additional names not in current use, such as *Trachymene macrophylla* (Domin) B.L. Burtt, have been applied to less widespread members of the species group in eastern Australia. Further work is needed to determine how many species and infraspecific taxa should be recognized in eastern Australia.

This paper gives a key for the 19 species of *Trachymene* occurring in Western Australia and a revision of the 14 species with many-flowered umbels. The remaining species with few-flowered umbels belong to sect. *Dimetopia* (Domin) Keighery & Rye and have been revised separately (Keighery & Rye 1999).

Methods

Specimens cited are all at PERTH except where otherwise indicated. Distribution maps were drawn up with each symbol representing the occurrence of the taxon in a 0.25 degree latitude by 0.25 degree longitude area.

Measurements were all obtained from dried material. The cotyledon measurements were often based on very few specimens as cotyledons are often torn or missing on mature plants, especially in the perennial species. Petal measurements were taken only from particularly well pressed flowers with minimal shrinkage. Petal colour was determined partly from the specimens and partly from field observations by Greg Keighery (pers. comm.); colours recorded for flowers in the notes on herbarium specimens are often inaccurate as they often refer to the fruit colour.

Three main categories of fruits are distinguished here: (1) homomorphic fruits with both monocarps fully developed and of the same type; (2) heteromorphic fruits with both monocarps maturing to full size but differing from one another in ornamentation; (3) asymmetric fruits with one monocarp infertile and reduced in size, therefore lacking the bilateral symmetry of the other types of fruits. Carpophore length is given only for fruits in which both monocarps develop fully and are shed at maturity. For species with asymmetric fruits a measurement is given instead for the infertile monocarp, which remains attached to the carpophore forming a thick fleshy persistent structure.

Key to the Western Australian sections, species and infraspecific taxa

Since fruit measurements, ornamentation and infertility rates are particularly important as key characters, it may not be possible to key specimens with only immature fruits, although it is often possible to determine most of these features from immature specimens. Abbreviations are used for other Australian states as follows: NSW – New South Wales, NT – Northern Territory, Qld – Queensland, SA – South Australia and Vic. – Victoria.

1. Perennials or robust annuals, with non-glandular simple or dendritic hairs occurring on the stems and/or leaves, the involucral bracts glabrous. Sepals conspicuous on the young fruits, at least some of them elongate or prominently clubbed. Petals usually cream to yellow and/or with pink tints. Distributed in the Northern Botanical Province ..... sect. **Hemicarpus**
   2. Stems densely and very conspicuously hairy throughout; hairs 5–7 mm long. Monocarp with a broad wing 2–3 mm wide. (Sturt Creek area; NT) ..... **T. villosa**
   2. Stems glabrous or with hairs concentrated at or near the nodes; hairs 3–6 mm long. Monocarp(s) not winged or with a narrow wing up to 1.2 mm wide
      3. Leaf indumentum with a dense mixture of small and large dendritic hairs; large hairs 2–5 mm long. Petals *c.* 1.5 mm long. Monocarp(s) with a wing 0.7–1.2 mm wide. (Halls Creek area; NT) ..... **T. dusenii**
      3. Leaf indumentum either of long unbranched hairs or of shorter dendritic hairs up to 1.2 mm long. Petals 0.8–1.2 mm long. Monocarp(s) scarcely winged or with a wing less than 0.5 mm wide
         4. Petioles of all of the divided or toothed leaves with long cilia throughout. Involucral bracts 1.5–4 mm long in fruit (not including connate base), the outermost pedicels 3–6 mm long. (Coulomb Point to Port Warrender and Ord River area; NT) ..... **T. microcephala**
         4. Petioles of the divided or toothed leaves (at least the upper ones) with the long cilia restricted to the base. Involucral bracts (3)4–14 mm long in fruit (not including connate base), the outermost pedicels 4–15 mm long
            5. Petioles with unbranched hairs (dendritic hairs may be present on the juvenile leaves) 2–6 mm long at base or rarely more widespread. Leaf blades glabrous or with unbranched (rarely inconspicuously dendritic) hairs 1–5 mm long scattered on the main veins. (Cape Leveque and Camballin to far north and Carlton Hill Station; NT) ..... **T. didiscoides**

5. Petioles with a fairly dense indumentum of dendritic hairs mostly *c.* 0.4 mm long but with a few large cilia 1–2.5 mm long. Leaf blades with dendritic hairs 0.4–1.2 mm long widespread (not restricted to the main veins). (Bonaparte Archipelago to Hann River and Pentacost Range) ..... **T. dendrothrix**

1. Tiny ephemeral to robust annuals, most species with simple glandular hairs, which are sometimes restricted to specific areas such as the base of each peduncle or the margins of the involucral bracts; involucral bracts nearly always with at least a few cilia. Sepals inconspicuous. Petals white to deep blue, often white with blue or purple tints. Occurring in the Eremean or South West Botanical Provinces, only one species (*T. oleracea*) extending into the Northern Botanical Province.

6. Tiny to medium-sized annuals, commonly almost prostrate to *c.* 0.05 m but occasionally a few extra-large specimens up to 0.2 m high, with small umbels of 3–21(50) flowers usually borne within or shortly above the vegetative part of the plants. Fruits consistently with both monocarps developed; carpophore compressed ..... sect. **Dimetopia**

7. Carpophore about half as long as commissure. Monocarps with two large terminal projections or wings. (Kennedy Range to York and Laverton area; SA, NSW) ..... **T. ceratocarpa**

7. Carpophore about as long as commissure. Monocarps not winged

8. Monocarps densely hairy and appearing woolly, covered throughout or at least on the outer margin by a very dense tangled indumentum of very long fine hairs. (Lyons River to Stirling Range and Yamarna; SA, NSW) ..... **T. ornata**

8. Monocarps glabrous to densely bristly but not woolly, the bristles radiating or bent but not tangled

9. Monocarps swollen, 0.7–1.1 x 0.5–0.8 mm, with no medial line visible, smooth (but often with shrinkage marks visible when dried). (Cape Cuvier to Murchison River area) ..... **T. elachocarpa**

9. Monocarps very compressed, 2.3–3.4 x 1.4–2.4 mm, with a distinct medial line, usually with a few hair-like bristles to densely bristly or tuberculate, rarely completely smooth

10. Stem hairs (when present) somewhat to distinctly retrorse, often appearing non-glandular. Umbels 3–6(7)-flowered. Fruits homomorphic; monocarps almost truncate at apex (outer margin extending horizontally beyond stylopodium); bristles smooth or with minute patent hairs. (Murchison River area to Stirling Range and Agnew area; SA, NSW, Vic.) ..... **T. cyanopetala**

10. Stems hairs (when present) patent, glandular. Umbels 5–21(50)-flowered. Fruits commonly heteromorphic with one monocarp bristly and the other tuberculate at least at apex; monocarps somewhat narrowed at apex (outer margin usually descending at 10–20 degrees to the stylopodium); bristles (when present) minutely retrorsely barbed. (Widespread in south-western Australia; SA, Vic.) ..... **T. pilosa**

6. Medium-sized to large, usually erect, annuals, 0.1–2.5 m high, with umbels of (15)30–300 flowers prominently displayed above the vegetative part of plant. Fruits inconsistently (few to most fruits per umbel) or consistently with 1 monocarp failing to develop fully; carpophore scarcely compressed ..... sect. **Didiscus**

11. Fruit of 1 fertile monocarp (i.e. asymmetric), slightly dorsiventrally compressed, prominently sculptured, with two ridges or wings on each face and transverse furrows delimiting 4–6 large pits on each surface between the ridges or wings. Plants with non-glandular hairs, from the South West Botanical Province. (Muntadgin to Stirling Range) ..... **T. croniniana**

11. Fruit of 1 or 2 fertile monocarps, greatly bilaterally compressed, smooth to bristly or tuberculate or with shallow irregular ridges, sometimes winged around margin but not on the faces. Plants with glandular hairs and/or occurring in the Northern and Eremean Botanical Provinces.

12. Cotyledons 2.5–10 mm wide. Fruit asymmetric; fertile monocarp with minute or slender glabrous tubercles or sometimes smooth, with 1 or 2 narrow marginal wings 0.1–0.6(0.8) mm wide. Distributed in the Northern and Eremean Botanical Provinces.

13. Uppermost leaves subtending peduncles stem-clasping, broad, often fan-shaped ..... **T. oleracea**

13a. Stems and leaves rather densely glandular-hairy. Monocarp with a broad wing 0.4–0.8 mm wide and elongate tubercles, the largest ones 0.4–0.6 mm long. (Napier Range and near Wyndham) ..... subsp. **sedimenta**

13a. Stems glabrous and leaves sparsely glandular-hairy. Monocarp with a narrow wing 0.1–0.3(0.4) mm wide and short tubercles, the largest ones 0.1–0.25 mm long. (Dampier Archipelago and Barlee Range to Halls Creek.) ..... subsp. **oleracea**

13. Uppermost leaves subtending peduncles either very narrow or with a long petiole.

14. Monocarp with two undulate wings 0.3–0.6 mm wide around margin and along commissure. (Newman to Montague Range and eastwards; NT) ..... **T. bialata**

14. Monocarp with a single entire wing 0.1–0.3 mm wide around margin but not along commissure.

15. Peduncles with small glandular hairs towards the base. Leaves broadly to depressed obovate in outline and deeply divided or lobed. (Wiluna and Laverton to Petermann Ranges; NT, SA, Qld, NSW) ..... **T. glaucifolia**

15. Peduncles glabrous. Leaves broadly to depressed ovate in outline and very deeply divided into narrow lobes. (Onslow to Mt Narryer Station to Great Northern Highway) ..... **T. pilbarensis**

12. Cotyledons 0.7–2.5 mm wide. Fruit asymmetric, homomorphic or heteromorphic, not consistently asymmetric throughout the umbel except in *T. grandis*; fertile monocarp(s) bristly, irregularly ridged, rugose, tuberculate or rarely smooth, not winged; tubercles (when present) either large and broad or with a terminal glandular hair. Distributed in the South West Botanical Province and South-western Interzone.

16. Pedicels glandular-hairy. Young fruit glandular-hairy or glandular-bristly. Distributed from Kalbarri south to Augusta and near Nannup, with an isolated record near Albany ..... **T. coerulea**

16a. Large stem hairs slender throughout, 0.7–1.5 mm long. Monocarp(s) tuberculate; tubercles 0.1–0.2 mm long, terminating in a simple glandular hair. (Jurien Bay to Augusta and near Albany) ..... subsp. **coerulea**

16a. Large stem hairs with a broad base, 1–5 mm long. Monocarp(s) bristly, rarely one bristly and one tuberculate; bristles *c.* 0.5 mm long, with minute side branches. (Kalbarri to Lake Indoon) ..... subsp. **leucopetala**

16. Pedicels glabrous. Young fruit glabrous or with non-glandular hairs or bristles. Distributed from near Jarrahwood inland to the Cundeelee-Zanthus area.

17. Umbels with all fruits asymmetric. Monocarp 3.3–5 mm long, usually either bristly (minute side branches present) or with discrete tubercles, rarely smooth. Extends from Pemberton east to Stirling Range ..... **T. grandis**

17. Umbels with the central fruits homomorphic and the outer fruits either homomorphic or asymmetric. Monocarp(s) 2.2–2.8 mm long, either irregularly rugose-tuberculate or with hair-like bristles. Distributed from near Stirling Range north-east to Cundeelee.

18. Stems usually partially glabrous; bracts glabrous or with few cilia. Outermost fruiting peduncles 7–11 mm long. Monocarp(s) tuberculate- rugose or with bristles 0.2–0.4 mm long; style 1.2–1.7 mm long. (Stirling Range to Forrestania and Mt Ragged) ..... **T. anisocarpa**

18a. Monocarp(s) rugose-tuberculate (with tubercles united into irregular ridges or an irregularly furrowed surface). (Stirling Range to Forrestania and Kumarl) ..... var. **anisocarpa**

18a. Monocarp(s) with hair-like bristles 0.2–0.4 mm long. (Esperance-Mt Ragged area) ..... var. **trichocarpa**

18. Stems and bracts usually glandular-hairy throughout. Outermost fruiting peduncles 11–16 mm long. Monocarp(s) with slender bristles, the largest ones 0.7–1 mm long; style 1.5–2.5 mm long. (Cundeelee–Zanthus area) ..... **T. pyrophila**

Descriptions of the many-flowered species

Implicit characters

Rather than repeat the characters found universally among the Western Australian members of the genus in each of the descriptions below, these characters are listed here. Note that the juvenile leaves and the leaves subtending the uppermost branches of the plants are not included in the descriptions given below unless specifically mentioned.

Cotyledons entire. *Leaves* concentrated towards base of plant, the basal few juvenile leaves often entire to slightly lobed and grading into larger distinctly lobed or divided leaves, the uppermost leaves

tending to be shorter and more scattered, those leaves or bracts subtending the upper branches being smallest. *Petioles* prominent on the basal leaves, shorter on the intermediate leaves but with a more expanded base, the uppermost leaves or bracts almost sessile. *Leaf blades* often cuneate at base, the primary division into three shallow to very deep lobes, which are either further divided or shallowly lobed to toothed; lower surface more prominently veined than upper surface. *Inflorescence* of an umbel terminating the main axis and usually several to many more umbels terminating lateral branches; umbels with central flowers usually maturing before outermost ones. *Involucral bracts* united at base into an open obconic structure; free portion subulate to ovate. *Fruit* with inner (adaxial) monocarp fully developed, shed from carpophore at maturity; outer (abaxial) monocarp sometimes failing to develop fully, if failing early then narrowly or very narrowly obconic and remaining united to the carpophore.

Distributions, breeding systems and chromosome numbers

The genus *Trachymene* is found throughout Western Australia. Distributions of all the many-flowered species are shown in Figures 1–3. It is notable that among the south-western species there is no known overlap in geographic range, except for an overlap in the ranges of *T. coerulea* subsp. *coerulea* and *T. grandis* (which usually differ in chromosome number), but adjacent species ranges generally appear to more-or-less meet so the species may be parapatric. This general pattern of each taxon taking over in distribution where another ends can be seen to a lesser extent in some other pairs of closely related species, such as *T. glaucifolia* and *T. pilbarensis*. It greatly reduces the likelihood of hybridization since only the more distantly related species are likely to coexist. There are no known cases of hybridization among the members of *Trachymene* sect. *Didiscus* in Western Australia, but the variability of some of the northern taxa and occurrence of occasional intermediate specimens merits further investigation for possible hybrids in sect. *Hemicarpus*.

Some data on breeding systems have been published (Keighery 1982a) for the following four members of sect. *Didiscus: Trachymene anisocarpa* [as *T. croniniana*], both subspecies of *T. coerulea* and *T. grandis* [as *T. anisocarpa*]. The taxon referred to as 'spec. nov.' is the inland variant of the typical subspecies of *T. coerulea*. Members of sect. *Didiscus* often undergo great fluctuations in population size, producing large populations after fires but few or no plants in years when there has been no disturbance. Flowers are protandrous, produce plentiful nectar and are displayed prominently above the foliage. They attract a large variety of small to medium-sized insect pollinators. The natural pollinators recorded by Keighery (1982a) were native bees, beetles, wasps, muscid and bombylid flies, butterflies and moths. Introduced honey bees are also attracted to the flowers. Plants are almost fully self-compatible so are able to produce high seed set even when cross-pollination fails.

All chromosome counts so far for the many-flowered species of Western Australia have been n=11 except for the tetraploid *T. grandis* with n=22 and one tetraploid count in the predominantly diploid species *T. coerulea*.

1. Trachymene sect. **Didiscus** (Hook.) Rye, *comb. nov.*

Didiscus Hook. (Hooker 1828: t. 2875). – *Didiscus* B. *Polyanthon* Domin *nom. illeg.* (Domin 1908: 27). – *Didiscus* sect. *Polyanthon* (Domin) C.A. Gardner *nom. illeg.* (Gardner 1931: 100) [= sect. *Didiscus*]. – *Didiscus* sect. *Teleiocarpus* F. Muell. *nom. illeg.* (Mueller 1859: 236) [= sect. *Didiscus*]. *Type: Didiscus coeruleus* (Graham) Hook. [= *Trachymene coeruleus* Graham].

Dimetopia sect. *Anisocarpaea* Turcz. *nom. inval.* (Turczaninow 1849: 29).

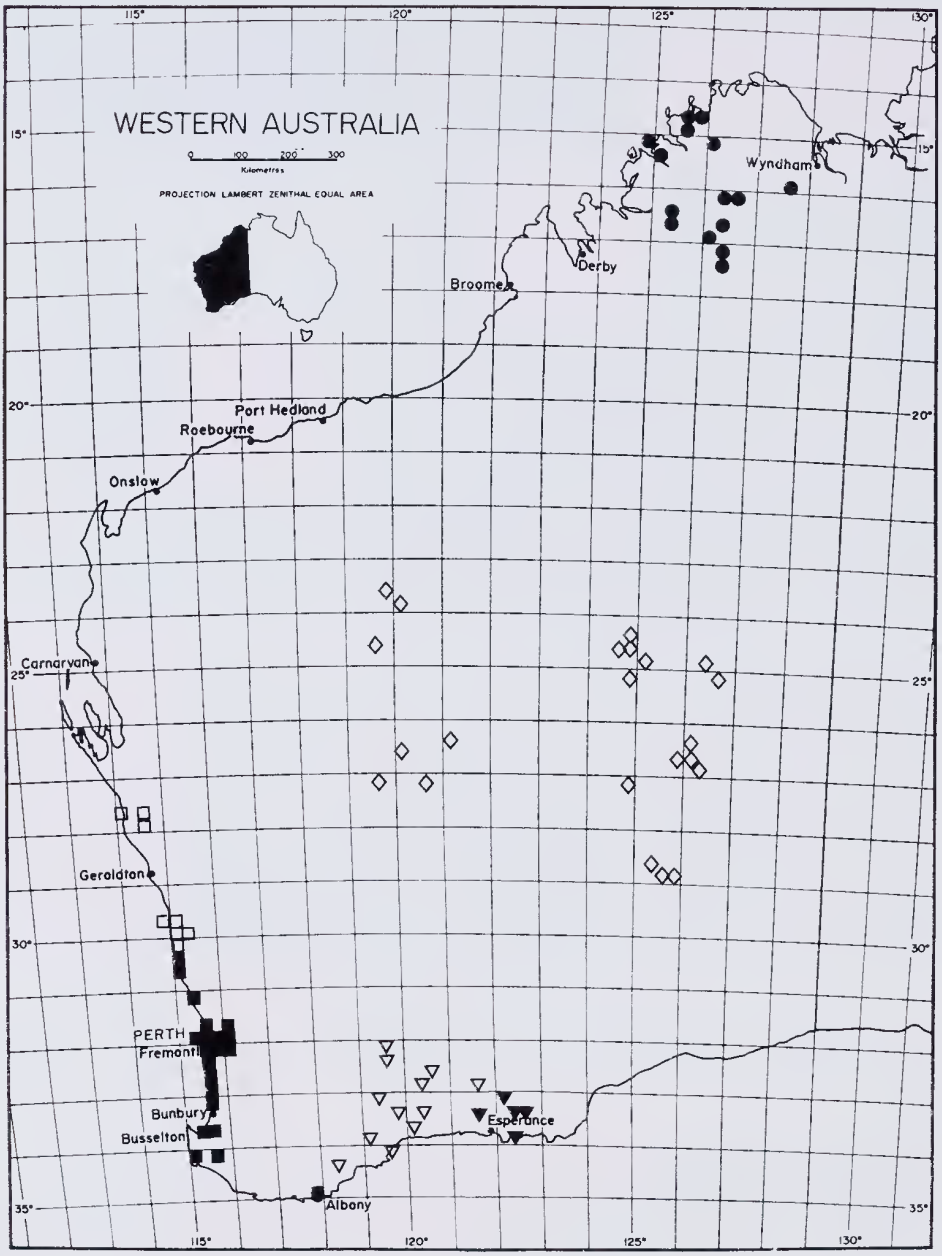

Figure 1. Full distribution of *Trachymene anisocarpa* var. *anisocarpa* ▽, *T. anisocarpa* var. *trichocarpa* ▼, *T. coerulea* subsp. *coerulea* ■, *T. coerulea* subsp. *leucopetala* □ and Western Australian distribution of *T. bialata* ◇ and *T. dendrothrix* ●.

Figure 2. Full distribution *Trachymene croniniana* ◇, *T. oleracea* subsp. *oleracea* ○ and *T. oleracea* subsp. *sedimenta* ◑ and *T. pyrophila* ◆ and Western Australian distribution of *T. microcephala* ▽.

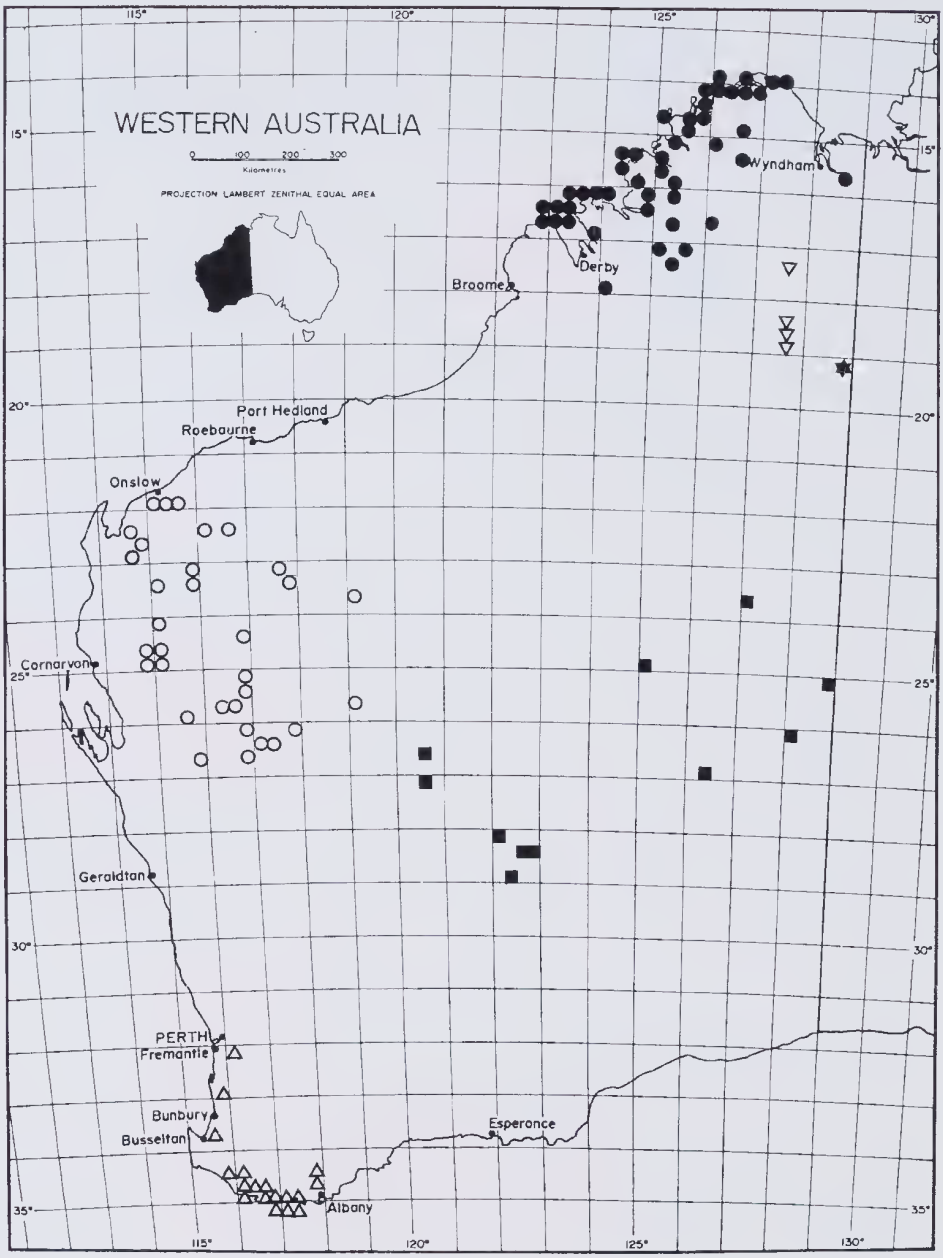

Figure 3. Western Australian distribution of *T. didiscoides* ●, *T. dusenii* ▽, *T. glaucifolia* ■, and *T. villosa* ✸ and full distribution of *T. grandis* △ and *T. pilbarensis* ○.

Annual herbs with glandular hairs (except *T. croniniana*). *Petioles* expanded at the base, sometimes prominently expanded but often varying between specimens in this character. *Flowers* often dimorphic, the outermost flowers with the outer petal distinctly enlarged, both types of flowers white to deep blue, or with a white corolla suffused with blue to purple on the outside, sometimes with a deep blue to violet centre (stylopodium and styles). *Sepals* 5 but of varied lengths and some usually so small as to appear absent, the largest sepal not very prominent. *Petals* large or medium-sized, the outer petal of the outermost flowers often extra large. *Fruit* usually of 1 fertile monocarp.

Etymology. Derived from the Greek *dis* – double and *discos* – disk, referring to the shape of the fruits found on the type species *Trachymeme coerulea*, as most fruits have both monocarps fully developed.

Notes. A section of at least 14 species, distributed in all states of Australia.

The name *Didiscus* is not a very suitable name for this section as a whole because most species produce only one fertile monocarp on all or most of their fruits. A later name that would have been more appropriate for the group in its meaning, as it refers to the presence of such fruits, is *Anisocarpaea*. Turczaninow (1849) placed the two species now known as *Trachymene anisocarpa* and *T. grandis* in sect. *Anisocarpaea* but did not validly publish the name.

Trachymene anisocarpa (Turcz.) B.L. Burtt (Burtt 1941: 44). – *Dimetopia anisocarpa* Turcz. (Turczaninow 1849: 29). – *Didiscus anisocarpus* (Turcz.) F. Muell. (Mueller 1859: 238). *Type:* Swan River Colony [Western Australia], 1847?, *J. Drummond* coll. 4, n. 132 (*holo:* KW *n.v.*, photograph PERTH; *iso:* PERTH 03579123).

Annual herb 0.2–1.5 m high, sometimes slightly viscid; indumentum (where present) of patent glandular hairs, sometimes losing glandular apex with age. *Stems* usually largely glabrous but with hairs fairly densely distributed for some distance above each node, and often also for a shorter distance below each node, sometimes sparsely hairy throughout; hairs 0.2–1.5 mm long, usually slender, rarely robust. *Cotyledons* 5–8 x 1–1.5 mm; lamina narrowly or very narrowly ovate. *Petioles* 10–50 mm long; expanded base 2–5 mm long, with cilia up to 2 mm long. *Leaf blades* broadly to depressed obovate in outline and deeply divided or lobed, 11–50 x 14–85 mm, often cuneate at base, the 3 primary lobes usually further trisected or bisected or dentate, both surfaces usually with a few hairs scattered along the veins. *Peduncles* 15–140 mm long, either glabrous or sparsely hairy for most of length but densely glandular-hairy at the base or fairly densely hairy throughout. *Involucral bracts* (10)17–26; base 1–2.5 mm long; free portion 4.5–10 mm long, usually glabrous or with 1 or 2 glandular cilia or teeth, rarely sparsely glandular-ciliate, the cilia or teeth 0.2–0.7 mm long. *Umbels* mostly 15–30 mm diam., approximately (20)40–120-flowered, the outer flowers sometimes all producing asymmetric fruits but at least some of the inner flowers producing homomorphic fruits. *Pedicels* 3–11 mm long; outermost ones 8–11 mm long in fruit, glabrous. *Petals* 1.5–2.5 mm long, white to deep purple or bluish on undersurface, very pale blue or white on upper surface. *Anthers* 0.3–0.4 mm long. *Fruit* highly bilaterally compressed, with both monocarps maturing or with the outer monocarp reduced usually to 0.6–1.4 mm long; carpophore 0.4–1.3 mm long; styles 0.8–1.7 mm long. *Fertile monocarp(s)* 2.2–2.8 x 1.6–2.1 mm, up to *c.* 0.6 mm thick, either with hair-like bristles or tubercles in merging rows forming a shallowly ridged or indented surface at maturity.

Distribution. Endemic to the South West Botanical Province of Western Australia. Extends from Forrestania (east of Hyden) southwards and from Chillinup Rd (south-east of Stirling Range) east to Cape Arid National Park.

Phenology. Flowering and fruiting period: Mainly October to November, also recorded January, March to June and August. Common after burns.

Notes. Previously, the south-western species *Trachymene grandis* and *T. croniniana* were often confused with this species, as well as a number of eastern and northern Australian species, as described in the introduction to this paper.

The locality of the type specimen of *T. anisocarpa* is unknown but evidently was from the western half of the species range as Drummond's fourth collection extended only as far east as West Mt Barren (Erickson 1969).

One specimen (an unmounted duplicate of *G.J. Keighery* 409) has one cotyledon with a deeply bifid lamina and the other cotyledon broken too close to the base to establish the shape of its lamina. This is the only known case among the Western Australian species examined in which the cotyledons are not entire. As in most other species, few of the *T. anisocarpa* specimens have intact cotyledons.

The species is fairly variable in leaf shape, some specimens having narrowly divided leaves similar to those of *T. grandis* and others having less divided leaves more like those of *T. pyrophila*. Two varieties are recognized.

a. Trachymene anisocarpa var. **anisocarpa**

Didiscus benthamii Domin *nom. illeg.* var. *benthamii* [as var. *typica nom. illeg.*] f. *benthamii* [as f. *muricatus nom. illeg.*] (Domin 1908: 40). *Type:* between Hamersley River and West River, Western Australia, 1901, *L. Diels* 4798 (*n.v.*).

Didiscus benthamii f. *microcarpus* Domin (Domin 1908: 40). *Type:* Swan River Colony [Western Australia], 1847?, *J. Drummond* coll. 4, n. 132 (*iso:* KW *n.v.*, photograph PERTH; PERTH 03579123).

Peduncles up to 95 mm long. *Fertile monocarp(s)* with the tubercles in merging rows forming a shallowly ridged or indented surface at maturity. (Figure 4A–D)

Other specimens examined. WESTERN AUSTRALIA: 13 km N of Ravensthorpe, 29 Oct. 1963, *T.E.H. Aplin* 2735; near Bounty Mine access road, near Mt Holland, 23 Nov. 1994, *G. Barrett*; 41 km E of Coujinup Hill, 25 June 1983, *M.A. Burgman* 1510 & *S. McNee*; 14.25 km due E of Muckinwobert Rock, 14 Aug. 1983, *M.A. Burgman* 2075 & *S. McNee*; Chillinup road, Gnowellen, 22 Mar. 1974, *A.E. Dixon*; Kumarl, Oct. 1938, *L.A. Horbury* 129; 266.7 miles [429 km] S of Perth on Lake King to Newdegate road, 5 Jan. 1975, *G.J. Keighery* 358; 100 km E of Lake King on Norseman road, 25 Oct. 1975, *G.J. Keighery* 409; 7 km W of crossroads at Forrestania, 6 May 1978, *G.J. Keighery* 1661; 20 km E of Jerramungup, 20 Nov. 1984, *K.R. Newbey* 10858; 2 km NW of Woolbernup Hill, Fitzgerald River National Park, 23 Nov. 1985, *K.R. Newbey* 11052; Hill 49, 22 Nov. 1990, *I. Solomon* 453; 6.1 miles [10 km] E of Ravensthorpe hotel on main road to Esperance, 12 Nov. 1973, *A.S. Weston* 8651; Peak Charles–Lake King road, vicinity of Frank Hann National Park, 28 Nov. 1973, *A.S. Weston* 9022.

Distribution. Extends from Forrestania (east of Hyden) southwards and from Chillinup Rd (south-east of Stirling Range) east to near Cape le Grand National Park. (Figure 1)

Figure 4. A–D. *Trachymene anisocarpa* var. *anisocarpa*. A – portion of plant (x1), B – base of peduncle with glandular hairs (x9), C – immature homomorphic fruit (x12), D – asymmetric fruit (x9); E – *T. anisocarpa* var. *trichocarpa* homomorphic fruit (x9); F–J. *T. pyrophila*. F – whole plant (x1), G – portion of stem with glandular hairs (x5), H – immature fruit with two slightly unequal monocarps (x7.5), I – asymmetric fruit (x7.5), J – carpophore and pedicel (x7.5). Drawn from *G.J. Keighery* 1661 (A,B,D), *A.S. Weston* 9022 (C), *R.J. Cranfield* 1370 (E), and *D.W. Goodall* 2417 (F–J).

Habitat. Occurs mainly in recently disturbed or burnt habitats, in clay or sandy clay, often in shrublands or woodlands dominated by *Eucalyptus* species with a mallee habit.

Chromosome number. n=11 (Keighery 1982b). Voucher specimens: *G.J. Keighery* 358, 409, 1661; possibly also *G.J. Keighery* 435, *n.v.* [all as *Trachymene croniniana*].

Conservation status. Not considered to be at risk.

Notes. The phrase name *Trachymene* sp. Ravensthorpe (*T.E.H. Aplin* 2735) has been used for this variety at PERTH. Most specimens are 0.2–0.7 m high but var. *anisocarpa* might occasionally grow much taller as suggested for the other variety.

Judging from the description, illustration and type locality given by Domin (1908) for *Didiscus benthamii*, this taxon is a synonym of the typical subspecies of *Trachymene anisocarpa*. The type was originally cited under var. *typica* [= var. *benthamii*] as *Diels* 4798, collected in 1901 during the voyage on behalf of the Humboldt Foundation, with the locality "inter Hammersley et West-River" added under the description of form *muricatus* [= f. *benthamii*].

Domin named a second variety from Queensland as *Didiscus benthamii* var. *bivestitus* Domin; this has since been raised to specific rank as *Trachymene bivestita* (Domin) L.A.S. Johnson. Domin also named two new forms of the type subspecies, one based on the type of *T. anisocarpa* and the other based on the type of *T. grandis* (see under those taxa). Hence his circumscription of *D. benthamii* included two closely related Western Australian species and a distantly related species from Queensland.

b. Trachymene anisocarpa var. **trichocarpa** Rye, *var. nov.*

Differt a *Trachymene anisocarpa* var. *anisocarpa* fructo setoso et habito plus arenaceo.

Typus: base of Hill 49, Cape Le Grand National Park, Western Australia, 19 November 1979, *R.J. Cranfield* 1370 (*holo:* PERTH 03579506).

Peduncles up to 140 mm long. *Fertile monocarp(s)* with hair-like bristles; larger bristles 0.2–0.4 mm long, sometimes with minute side branches towards the base. (Figure 4E)

Distribution. Extends from north of Esperance east to near Mt Ragged in Cape Arid National Park. (Figure 1)

Habitat. Occurs mainly in recently disturbed or burnt habitats, in rather sandy soils, often in woodlands dominated by *Eucalyptus* species with a mallee habit.

Other specimens examined. WESTERN AUSTRALIA: 1 mile [1.6 km] E of Kau Rock, 16 Oct. 1970, *T.E.H. Aplin* 4091; 540 mile peg between Esperance and Salmon Gums [*c.* 18 km S of Grass Patch], 5 Nov. 1962, *J.S. Beard* 2346; 10 km N of Mt Ridley, 26 Oct. 1976, *G.J. Keighery* 417; 45 km NNE of Condingup, 8 Nov. 1980, *K.R. Newbey* 8238.

Chromosome number. n=11 (Keighery 1982b). Voucher specimens: *G.J. Keighery* 417 [as *Trachymene croniniana*]; probably also *G.J. Keighery* 1719, *n.v.* [as *Trachymene* aff. *croniniana*].

Conservation status. CALM Conservation Codes for Western Australian Flora: Priority Three. Var. *trichocarpa* is known from five localities, including one in a national park. It is common after fires, apparently surviving in unburnt vegetation mainly in the form of dormant seeds. Populations may therefore be effectively invisible except after fires.

Etymology. From the Greek *trichos* – hair or bristle and *karpos* – fruit, the hair-like bristles on the fruits being the distinguishing feature of this variety.

Notes. This variety was previously known by the phrase name *Trachymene* sp. Esperance (*R.J. Cranfield* 1370). It probably tends to be a larger plant, with longer peduncles, than the type variety. The only consistent morphological difference between the two varieties, however, is in fruit ornamentation, with var. *anisocarpa* having an irregularly ridged-tuberculate surface to the fertile monocarps. The two varieties overlap slightly in known geographical range, with both variants recorded from Hill 49, but var. *trichocarpa* is restricted to the eastern part of the species distribution while the typical variant occurs mainly in the western and central parts. They appear to differ in habitat, with var. *trichocarpa* occurring in more sandy soils than var. *anisocarpa*.

Three other many-flowered south-western *Trachymene* species have fruits that are always or sometimes bristly. In these species the bristles are usually longer and with larger, more numerous side branches.

Trachymene bialata (Domin) B.L. Burtt (Burtt 1941: 45). – *Didiscus bialatus* Domin (Domin 1908: 51–52). *Type:* "N." Barrow Range, [Western Australia], 17 August 1891, *R. Helms* (K, NSW, *n.v.*).

Annual herb usually 0.2–1.0 m high; indumentum (where present) of patent glandular hairs. *Stems* largely glabrous but with hairs fairly densely distributed for a short distance at the base of each peduncle, the lower stems either completely glabrous or with fewer hairs above each node; hairs 0.1–0.6 mm long. *Cotyledons* 11–24 x 3.5–6 mm; lamina ovate to obovate or narrowly so. *Petioles* 35–115 mm long, largely glabrous to fairly densely hairy; expanded base 2–12 mm long, with cilia up to 1.5 mm long. *Leaf blades* very broadly to depressed ovate to obovate in outline, palmisect, 15–33 x 25–50 mm, cuneate at base, the 3 primary lobes usually further trisected or bisected or dentate, almost glabrous to fairly densely hairy, with few to numerous minute hairs and also a few large robust hairs scattered along the veins, the large hairs 0.4–0.6 mm long. *Peduncles* 35–140 mm long, glandular-hairy at base and glabrous above. *Involucral bracts* usually 12–20; base 0.8–1.6 mm long; free portion 3.5–7 mm long, glandular-ciliate and sometimes with a few glandular teeth, also with a few hairs on the surface especially along midvein; cilia or teeth 0.1–0.5 mm long. *Umbels* mostly 14–30 mm diam., approximately (30)40–140-flowered. *Pedicels* 1.5–11 mm long; outermost ones 6.5–11 mm long in fruit, glabrous. *Petals* usually 2–3 mm long, usually pale blue to purple on undersurface, white on upper surface. *Anthers* 0.3–0.5 mm long. *Fruit* highly bilaterally compressed, with the outer monocarp very reduced and 2–2.8 mm long; styles 1.7–2.8 mm long. *Fertile monocarp* with a body 3.5–4.3 x 2.6–3.5 mm, up to *c.* 1 mm thick, usually shortly tuberculate, with two divergent wings fully encircling the body of the monocarp; wings crenulate, 0.3–0.6 mm wide, becoming thickened; tubercles up to 0.3 mm long. (Figure 5A).

Selected specimens examined. WESTERN AUSTRALIA: 26 km S of Newman turnoff Great Northern Highway, 11 Sep. 1978, *A.C. Beauglehole* 59350 & *E.G. Errey* 3050; Eagle Bore Study Site, Gibson Desert Nature Reserve, 1 Sep. 1991, *A. Chapman & S. Fraser* 34; 10 miles [16 km] W of Wiluna, 16 Oct. 1945, *C.A. Gardner* 7903; 34 miles [55 km] W of Warburton, 24 Aug. 1962, *A.S. George* 3968;

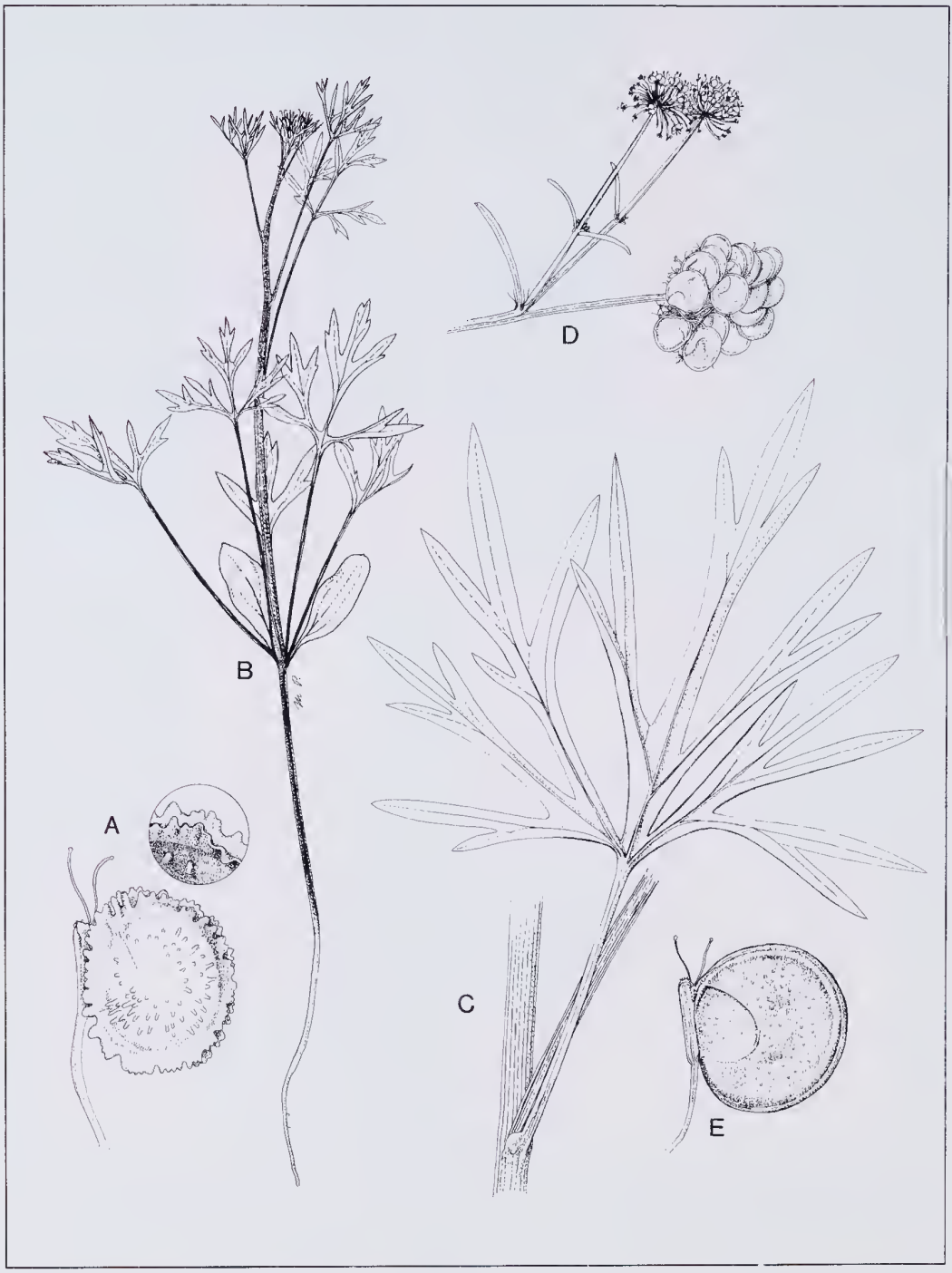

Figure 5. A – *Trachymene bialata* asymmetric fruit (x5), with close-up view of double wing (x10); B–E. *Trachymene pilbarensis*. B – young plant with cotyledons still attached (x1), C – stem and young leaf from mature plant (x1), D – flowering and fruiting inflorescences (x1), E – asymmetric fruit (x4.5). Drawn from *H. Demarz* 7230 (A), *S. van Leeuwin* 1349 (B), Hamersley Iron Herbarium 1507 (C) and *H. George* 1146 (D,E).

Miss Gibson Hill, 26 Aug. 1962, *A.S. George* 4072; Young Range, 22 Jan. 1964, *M. Gillett* 61; 40 km SSE of E end of Clutterbuck Hills, 14 June 1983, *S.D. Hopper* 2900; 151.5 miles [244 km] N of Seemore Downs Station Homestead, Connie Sue Highway, 20 Sep. 1975, *G.J. Keighery* 552; 65 miles [105 km] N of Sandstone on Wiluna road, 15 Oct. 1972, *R.D. Royce* 10439; 12 miles [19 km] NE of Millrose, 8 Sep. 1958, *N.H. Speck* 1382.

Distribution. Occurs in the Eremean Botanical Province of Western Australia, extending from near Newman south to near Montague Range (south-east of Wiluna), south-east to between Neale Junction and Plumridge Lakes and east towards the Northern Territory border. Also occurs in Northern Territory. (Figure 1)

Habitat. Commonly occurs on red sandy soil with spinifex (*Triodia*), usually on sandplains but also recorded in gravelly soils and on lateritic soils above gorges or breakaways, sometimes in *Acacia* shrublands, with one record from *Eucalyptus gongylocarpa* savannah. The species is probably favoured by fires although only one habitat record mentions that the area had recently been burnt.

Phenology. Flowering and fruiting period: mainly June to October, also recorded January.

Chromosome number. n=11 (Keighery 1982b). Voucher specimen: *G.J. Keighery* 552.

Conservation status. Not considered to be at risk.

Notes. Readily distinguished from all other Western Australian species by the crenulate double wings encircling the body of the monocarp including the portion along the commissure. The other taxa described in this paper either lack wings or have a single wing extending around the margin of the monocarp but not along the commissure.

In *T. bialata* the flowers have blue or purple tints on the undersurface of the petals, with the styles often bluish and the stylopodium often deep blue-purple. The umbels have up to about 20 bracts and 140 flowers, but a depauperate specimen from Young Range (*M. Gillett* 61) has some umbels with only *c.* 10 bracts and *c.* 30 flowers.

Trachymene coerulea Graham (Graham 1828: 380–381). – *Didiscus coeruleus* (Graham) Hook. (Hooker 1828: t. 2875). – *Didiscus cyaneus* DC. *nom. illeg.* (de Candolle 1829: 28, t. 4). – *Huegelia coerulea* (Graham) Reichb. (Reichenbach 1830: 1–2, t. 201). – *Trachymene cyanea* A. Cunn. ex DC. *nom. inval.* (de Candolle 1830: 72). *Type:* cultivated at Edinburgh Royal Botanic Garden from seeds sent from New Holland [Western Australia] by Mr Fraser (*lecto:* illustration t. 2875 from Hooker (1828), here chosen).

Annual herb 0.2–1.2 m high, viscid; indumentum of patent glandular hairs. *Stems* with a usually dense indumentum of hairs of very variable size; largest hairs 0.6–5 mm long, slender or robust. *Cotyledons* 5.5–10 x 0.7–2.3 mm; lamina narrowly or very narrowly ovate. *Petioles* commonly less than 10 mm long but up to 50 mm long on lower leaves; expanded base often not distinguishable, commonly *c.* 2 mm long, with cilia up to 2 mm long. *Leaf blades* usually broadly to depressed obovate in outline and deeply divided, 10–70 x 11–60 mm, the 3 primary lobes usually further trisected or bisected, both surfaces usually rather densely hairy. *Peduncles* 15–200 mm long, densely hairy. *Involucral bracts* 14–32; base 3–6 mm long; free portion 11–20 mm long, densely glandular-ciliate and with scattered glandular hairs over the outer surface; larger cilia 0.4–1 mm long. *Umbels*

20–60 mm diam., approximately 130–300-flowered, usually with most flowers producing homomorphic or heteromorphic fruits but some of the flowers producing asymmetric fruits. *Pedicels* 2–25 mm long, rather densely glandular-hairy throughout or less densely so towards base, the largest hairs 0.4–1 mm long and sometimes concentrated towards the summit, occasionally blue; outermost ones 13–25 mm long in fruit. *Petals* commonly 2–2.5 mm long, white to deep blue. *Anthers* 0.3–0.5 mm long. *Fruit* highly bilaterally compressed, with both monocarps maturing or with the outer monocarp very to somewhat reduced in size, when very reduced 1.3–2.5 mm long; carpophore 1.2–2.5 mm long; styles 1.0–1.5 mm long. *Fertile monocarp(s)* 1.8–4.8 x 1.5–3.1 mm, up to *c.* 0.6 mm thick not including the ornamentation, either bristly or tuberculate, each tubercle terminating in a hair.

Distribution. Endemic to the South West Botanical Province of Western Australia. Extends from Kalbarri National Park south to near Augusta, with an isolated record from Wilyung Hill (near Albany).

Chromosome number. n=11 (Constance & Bell 1960, Wanscher 1933). Additional records are cited for each subspecies.

Notes. Of the species described in this paper, *Trachymene coerulea* is the only one for which heteromorphic fruits have been recorded, although these fruits are apparently very rare and are known in only one of its two subspecies. Heteromorphic fruits are common in one other Western Australian species, *T. pilosa*, as described in Keighery & Rye (1999).

a. Trachymene coerulea Graham subsp. **coerulea**. – *Trachymene coerulea* Graham var. *coerulea.*

Illustrations. These include Bennett (1988: Figure 252), Hooker (1828, t. 2875) and Rippey & Rowland (1995: 240–241).

Annual herb 0.2–1.2 m high. *Peduncles* usually with all hairs fine; large hairs up to 1.5 mm long, with a slender base usually *c.* 0.1 mm wide. *Involucral bracts* 20–32, often deeply blue in distal quarter to half of free portion, sometimes paler blue or with blue extending most of length, usually with all hairs fine. *Petals* usually pale to deep blue, rarely white. *Fruit* homomorphic or asymmetric; fertile monocarp(s) 2.5–4.8 x 1.6–3.1 mm, tuberculate, with a short unbranched hair at the centre of each tubercle; tubercles 0.1–0.2 mm long. **Blue Lace Flower** or **Rottnest Island Daisy**

Selected specimens examined (limestone variant). WESTERN AUSTRALIA: 6 km NE of Cervantes, 11 Dec. 1985, *J.J. Alford* 80; Yanchep, 21 Oct. 1965, *E.M. Bennett* 181; Rottnest Island, 21 Nov. 1972, *R.A. Congdon*; Cottesloe, Jan. 1923, *L. Glauert*; Yanchep National Park, 2 Jan. 1992, *A. Greig* 32; Wongonderrah Rd, Nambung National Park, 22 Nov. 1992, *E.A. Griffin* 7921; North Fremantle, 19 Dec. 1897, *R. Helms*; Yanchep National Park, 29 Jan. 1964, *A.M. James* 188; 11 miles [18 km] S of Mandurah, 19 Oct. 1973, *G.J. Keighery* 2198; Raebold Hill, City Beach, 5 Dec. 1985, *G.J. Keighery* 6330; 20 km W of Harvey, 15 Jan. 1984, *G.J. Keighery* 6543; 5 km S of Lancelin, 1 Dec. 1985, *G.J. Keighery* 7931; Trigg townsite, 14 km N of Perth, 1 Dec. 1987, *G.J. Keighery* 9608; SW of Ludlow, 1 Feb. 1996, *G.J. Keighery* 14354; Rockingham, Dec. 1959, *H. Kretchman* 12282; S of Rockingham, 24 Jan. 1964, *R.A. Saffrey* 101.

Selected specimens examined (non-limestone variant). WESTERN AUSTRALIA: Swan View, Dec. 1900, *Diels & Pritzel* 327; Quarry Rd, Avon Valley National Park, 23 Dec. 1989, *B. Evans* 197; Wongong Gorge, 26 Dec. 1959, *A.S. George* 459; 4.1 km E of Stewart Rd on Brockman Highway, 4 Jan. 1975, *G.J. Keighery* 346; Wilyung Hill, 10 Nov. 1982, *G.J. Keighery* 5624; Darlington, 28 Nov. 1903, *A. Morrison*; Helena Valley, 20 Nov. 1977, *J. Seabrook* 491.

Distribution. Extends along the coast and on off-shore islands from near Cervantes southwards and from the Darling Range near Perth south to near Augusta, with an isolated record from Wilyung Hill near Albany. (Figure 1)

Habitat. Occurs on limestone or dunes along the coast, in deep sand on the western side of the Swan Coastal Plain, on sandy or clayey soils on the eastern side of the Swan Coastal Plain and often associated with granite in the Darling Range and the southern parts of the species' distribution.

Phenology. Flowering and fruiting period: mainly October to January. On the mainland the species occurs in great numbers following fires but is rarely seen otherwise. On Rottnest and Garden Islands, where fires were extremely rare prior to settlement, the species has overcome the fire-dormancy requirement, germinating each year without any need for fire (G.J. Keighery pers. comm.).

Chromosome number. n=11 for limestone variant and n=?11,22 for non-limestone variant (Keighery 1982b). Voucher specimens for limestone variant: *G.J. Keighery* 2198; probably also three unnumbered collections of *G.J. Keighery*, all *n.v.* Voucher specimens for non-limestone variant: *G.J. Keighery* 346 [as *T. anisocarpa*] with n=22; probably also *G.J. Keighery* 600, *s.n.*, both *n.v.* [as *Trachymene* sp. II] with n=11.

Conservation status. Not considered to be at risk.

Notes. Monocarps are 2.5–3.5 mm long in most areas but approximately 4–5 mm long on Garden Island specimens, with short glandular hairs at first, becoming rugose with pyramid-shaped tubercles, each with a short terminal glandular hair.

There are two main variants. The typical variant occurs mainly on limestone or dunes near the coast, but is also recorded from Booragoon and Cannington in sandy soils, extending from near Cervantes south to near Lake Preston, and usually has deeply coloured blue flowers in umbels 25–60 mm diam. with a peduncle 30–200 mm long. The other variant occurs usually in soils with a greater proportion of clay, often associated with granite, extending from the Darling Range near Perth south to near Augusta, with an isolated record from Wilyung Hill near Albany, and usually has white or pale blue flowers in umbels 20–35 mm diam. with a peduncle 15–140 mm long.

Both of the common names cited above apply to the coastal variant of this subspecies. The name Blue Lace Flower was favoured by Bennett (1988) and Wheeler (1987), but both names were listed by Rippey & Rowland (1995).

b. Trachymene coerulea subsp. **leucopetala** (F. Muell. ex Benth.) Rye, *stat. nov.*

Trachymene coerulea var. *leucopetala* F. Muell. ex Benth. (Bentham 1867: 349). – *Didiscus coeruleus* var. *leucocephalus* (F. Muell. ex Benth.) Domin (Domin 1908: 44–45). *Type:* Murchison River, [Western Australia], *Oldfield* (*n.v.*).

Annual herb 0.2–0.5 m high. *Peduncles* with a mixture of coarse and fine hairs; large hairs up to 5 mm long, with a broad base usually 0.2–0.3 mm wide. *Involucral bracts* 14–28, green throughout, with a mixture of coarse and fine hairs. *Pedicels* with glandular hairs up to 1 mm long in distal half and with a shorter, less dense indumentum or almost glabrous in basal half. *Petals* usually white, sometimes very pale blue. *Fruit* homomorphic, heteromorphic or asymmetric; fertile monocarp(s)

1.8–3.0 x 1.5–2.0 mm, bristly or (in heteromorphic fruits) the outer one bristly and the inner one tuberculate-rugose; bristles commonly 0.6–0.8 mm long, coarse, the apex glandular, with minute retrorse to patent side branches. (Figure 6A–C)

Other specimens examined. WESTERN AUSTRALIA: Red Bluff, 25 Nov. 1980, *D.R. Bellairs* 1063; Cliff Head, 29 Oct. 1967, *A.C. Burns* 126; 390–394 mile pegs on North West Coastal Highway, 23 Oct. 1966, *A.C. Burns* 1047; Kalbarri, 18 Dec. 1968, *H. Demarz* 913; Lesueur National Park, 16 Dec. 1993, *B. Evans* 774; Rocky Springs Reserve, 10 km S of Eneabba, 13 Nov. 1978, *E.A. Griffin* 1654; railway line, N of Arrowsmith siding, 3 Feb. 1992, *E.A. Griffin* 6745A; 7 km W of Lake Indoon, 7 Feb. 1977, *R. Hnatiuk* 770010; Ajana, Sep. 1958, *D.H. Perry*; 20 miles [32 km] N of Ajana, 15 Nov. 1959, *L. Steenbohm & F. Lullfitz.*

Distribution. Extends along the coast from Kalbarri National Park south to near Lake Indoon and inland to Ajana and near Eneabba. (Figure 1)

Habitat. Occurs in sand, often over sandstone, limestone or ironstone.

Phenology. Flowering and fruiting period: late October to early February.

Chromosome number. n=11 (Keighery 1982b). Voucher specimen: *Young* 485 *n.v.*

Conservation status. Not considered to be at risk.

Notes. On the coast this taxon is replaced south of Eneabba, in a quite sudden transition, by the bright blue-flowered typical variant of the species; inland on granite and lateritc it is replaced by the white- or pale blue-flowered hills variant of subsp. *coerulea.* Subsp. *leucopetala* has medium-sized umbels 20–45 mm diam. on a peduncle 30–120 mm long. It can be distinguished vegetatively from the other subspecies by its coarser glandular hairs on the peduncles and bracts and the larger hairs on the base of the flowers, and tends to be a smaller plant. It also tends to have smaller numbers of bracts and flower per umbel and probably the pedicels less densely hairy towards the base than subsp. *coerulea* but there is considerable overlap for these characters.

There are too few mature fruiting specimens to accurately determine fruit size in subsp. *leucopetala* but it appears to have smaller fruits generally than subsp. *coerulea.* One specimen (*B. Evans* 774) from Lesueur National Park has heteromorphic fruits (Figure 5C) and also asymmetric fruits in each umbel, the inner monocarp tuberculate-rugose and the outer one either full-sized and bristly or much reduced. Possibly some of the other specimens would also exhibit heteromorphy if they were in mature fruit, but it appears that most plants in this subspecies produce homomorphic fruits. The tuberculate-rugose monocarps tend to have a row of large tubercles along the medial line, more compressed tubercles around the margin and often a group or tubercles towards the base or a few scattered ones, with the remainder of the surface somewhat rugose. The tuberculate monocarps of subsp. *coerulea* differ in having numerous smaller tubercles more uniformly distributed across the surface.

Trachymene croniniana (F. Muell.) T. Durand & B.D. Jacks. (Durand & Jackson 1902: 136). – *Didiscus croninianus* F. Muell. (Mueller 1895: 144). *Type:* towards Coolgardie, [Western Australia], *Cronin* (MEL 98616).

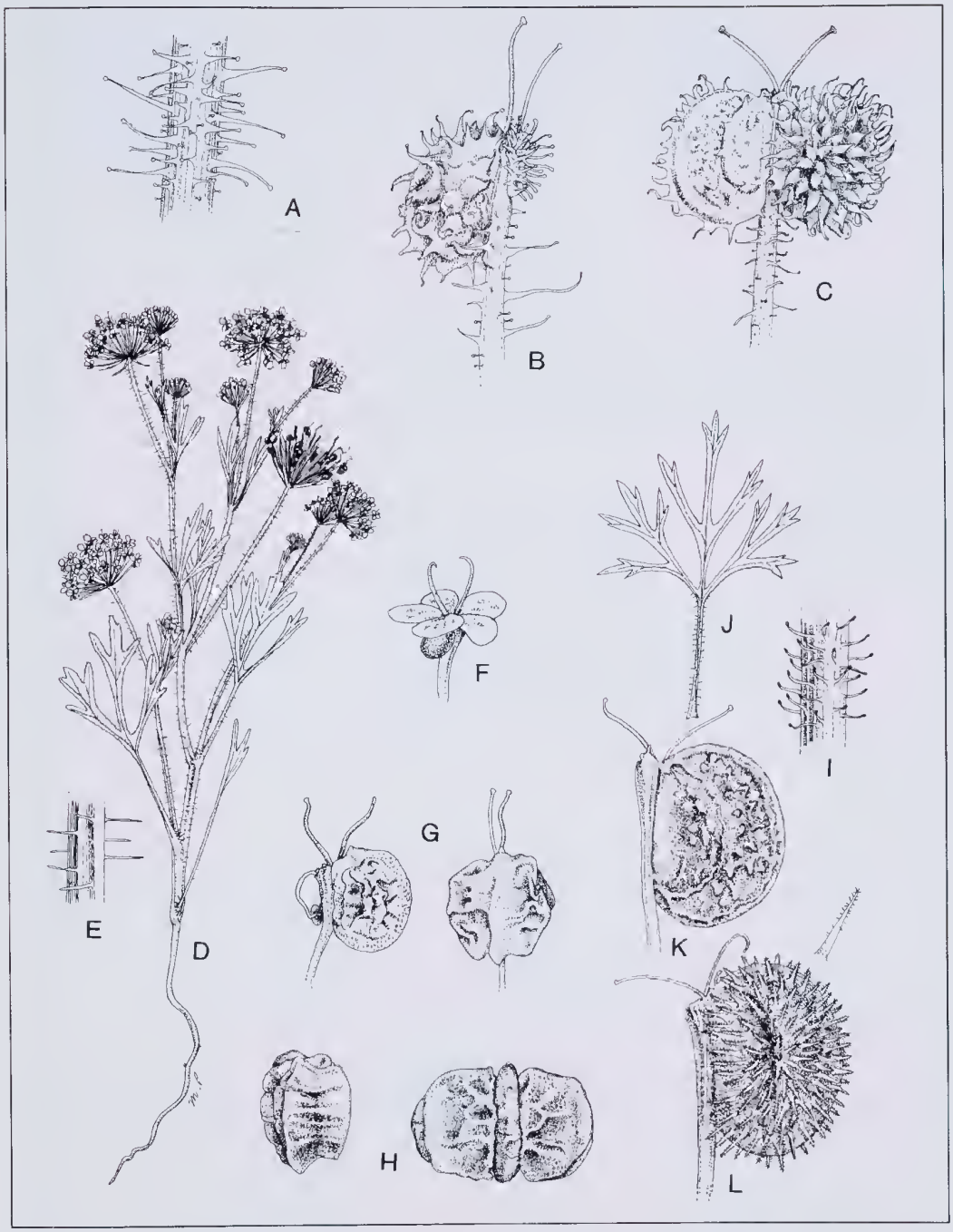

Figure 6. A–C. *Trachymene coerulea* var. *leucopetala*. A – portion of peduncle with glandular hairs (x6), B – asymmetric fruit (x10), C – heteromorphic fruit (x8); D–H. *Trachymene croniniana*. D – whole plant (x1), E – portion of stem with non-glandular hairs (x5), F – very immature fruit (x9), G – lateral and adaxial views of asymmetric fruit of northern variant (x9), H – lateral and adaxial views of asymmetric fruit of southern variant (x11); I–L. *T. grandis*. I – base of peduncle with glandular hairs (x9), J – leaf (x1), K – tuberculate asymmetric fruit (x8), L – bristly asymmetric fruit (x8), with enlarged bristle. Drawn from *D.R. Bellairs* 1063 (A,B), *B. Evans* 774 (C), *E.T. Bailey* 560 (D–G), *Wittwer* 1510 (H), *G.J. Keighery* 2154 (I–K) and *G.J. Keighery* 6528 (L).

Annual herb 0.1–0.2 m high; indumentum of patent non-glandular hairs. *Stems* fairly uniformly but rather sparsely hairy; hairs 0.4–1.4 mm long, robust. *Cotyledons c.* 6 x 1 mm; lamina narrowly elliptic. *Petioles* 17–55 mm long; expanded base 2.5–14 mm long, with non-glandular cilia mostly 0.5–2.5 mm long. *Leaf blades* broadly to depressed obovate, deeply lobed, 14–35 x 8–54 mm, cuneate at base, the 3 primary lobes usually further trisected or bisected or dentate, the ultimate teeth mucronate, both surfaces usually with a few non-glandular hairs scattered along the veins, the lower surface much more prominently veined than upper surface. *Peduncles* 16–72 mm long. *Involucral bracts* 11–18; base 0.6–1.4 mm long; free portion 4–6 mm long, glabrous or with a few (usually 1 or 2) cilia or teeth 0.1–0.4 mm long. *Inflorescence* 11–22 mm diam., approximately 40–80-flowered. *Pedicels* 2–9 mm long; outermost ones 5–9 mm long in fruit. *Petals* 1.3–1.8 mm long, often pale to deep violet-purple on undersurface, white on upper surface. *Anthers c.* 0.3 mm long. *Fruit* bilaterally compressed at first but not at maturity, with the outer monocarp very reduced and 0.8–1.3 mm long; styles 1.2–1.4 mm long. *Fertile monocarp* 1.8–2.0 x 1.3–1.5 mm, 1.5–2.5 mm thick, highly sculptured, with 2 prominent longitudinal projections or wings on each face and transverse furrows delimiting 4–6 large pits on each surface of each projection, the outer margin thickened or produced into a narrow but definite wing. (Figure 6D–H)

Other specimens examined. Bruce Rock district, *E.T. Bailey*; Muntadgin, Sep. 1945, *E.T. Bailey* 560; 6 km W of Formby South Rd on Salt River Rd towards Cranbrook, Stirling Range, 14 Nov. 1982, *G.J. Keighery* 5790; 21 km NE of Ongerup, 31 Oct. 1974, *K.R. Newbey* 4550; 14 miles [23 km] W of North Lake Grace, 29 Nov. 1974, *Wittwer* 1510.

Distribution. Endemic to the South West Botanical Province of Western Australia. Extends from Muntadgin south to Stirling Range National Park. (Figure 2)

Habitat. Recorded from "lateritic sand", from "well drained shallow loamy sand" and from "coarse gritty sand over clay", the last locality described as a creek bed with a woodland of *Eucalyptus occidentalis*.

Phenology. Flowering and fruiting period: September to December. The species is favoured by fires, apparently producing very large populations after fires and becoming very rare in intervening periods.

Conservation status. CALM Conservation Codes for Western Australian Flora: Priority Three. Known from few specimens. As in related species, population size fluctuates widely in *T. croniniana* because of its fire-dependence. Assessment of its conservation status is therefore difficult.

Notes. A very distinctive species, immediately recognizable from other south-western species by its non-glandular indumentum and odd fruit. The description of the species is based on few specimens and very few with relatively mature fruits, although all have immature fruits. The fruit always has one fertile monocarp and the other monocarp very reduced. Although appearing typical when immature, the fruit is quite atypical of the genus at maturity, being slightly to distinctly dorsiventrally compressed (rather than bilaterally compressed) and highly sculptured with protruding ridges or wings and large pits. The only other member of the genus observed to have monocarps with significant dorsiventral breadth is a species from Northern Territory, *Trachymene inflata* Maconochie, which has a prominent longitudinal ridge on each face, the whole fruit covered with long bristles.

There appear to be two variants of *Trachymene croniniana*, the atypical one recorded from the Lake Grace area south to Stirling Range National Park, with stem hairs 0.4–0.65 mm long and the fertile

monocarp with prominent wings exceeding the margin (Figure 6H). The type variant, recorded in the Bruce Rock–Muntadgin area, has stem hairs 1–1.4 mm long and the fertile monocarp is apparently less dorsiventrally compressed but probably not fully mature, with a more prominent marginal wing (Figure 6G). More material with mature fruits is needed to determine whether there really are two distinct kinds of fruits, as each kind is currently known from only one specimen in PERTH.

Trachymene glaucifolia (F. Muell.) Benth. (Bentham 1867: 350). – *Didiscus glaucifolius* F. Muell. (Mueller 1853: 395). *Type:* Elders Range, [South Australia], October 1851, *F. Mueller* (K, MEL, *n.v.*).

Illustrations. Boyland & Stanley (1981: Figure 354,4), Eichler (1986: Figure 500D).

Annual herb 0.1–0.5 m high, often glaucous; indumentum (where present) of patent glandular hairs. *Stems* largely glabrous but with hairs distributed for a short distance on base of each peduncle and sometimes above each of the upper nodes; hairs mostly 0.1–0.3 mm long but up to 0.6 mm. *Cotyledons* 14–16 x 2.5–4 mm; lamina narrowly or very narrowly oblong-elliptic (slightly ovate to slightly obovate). *Petioles* 15–105 mm long; expanded base 3–6 mm long, with cilia up to 2 mm long. *Leaf blades* broadly to depressed obovate in outline and deeply divided or lobed, 15–40 x 15–60 mm, cuneate at base, the 3 primary lobes usually further trisected or bisected or dentate, glabrous or with a few hairs scattered along the veins. *Peduncles* commonly 60–90 mm long but not seen in mature fruiting stage, glabrous for most of length but fairly densely glandular-hairy at the base. *Involucral bracts* 15–26; base usually 1–1.5 mm long; free portion commonly 5–7 mm long, glandular-ciliate, sometimes with a few glandular-ciliate teeth, often also with a few glandular hairs on the outer surface; cilia mostly 0.1–0.4 mm long, the teeth up to 2 mm long. *Umbels* commonly 15–30 mm diam. and 80–150-flowered. *Pedicels* commonly 3–10 mm long, glabrous. *Petals c.* 2 mm long, often deeply blue or purple on undersurface, white or pale blue to mauve on upper surface. *Anthers* 0.4–0.6 mm long. *Fruit* highly bilaterally compressed, with the outer monocarp very reduced and probably 1.5–2.5 mm long; styles probably 1.5–2.5 mm long. *Fertile monocarp* not seen at maturity.

Selected specimens examined. WESTERN AUSTRALIA: 99 km N of Agnew, 19 Aug. 1963, *T.E.H. Aplin* 2401; 27 km by road NE of Beria, 30 km NE of Laverton–Warburton road, 16 Sep. 1978, *A.C. Beauglehole* 59859 & *E.G. Errey* 3559; 179 km E of Warburton Mission on Docker Mission road, 20 Sep. 1978, *A.C. Beauglehole* 60297 & *E.G. Errey* 3997; S side of Petermann Ranges, 22 Sep. 1978, *A.C. Beauglehole* 60670 & *E.G. Errey* 4370; Lake Violet Station, July 1941, *F.M. Bennett* 57; 33 miles [53 km] SE of Windulda, Warburton road, 25 Aug. 1962, *A.S. George* 4003; 27.7 miles [44 km] E of Laverton, 18 Sep. 1975, *G.J. Keighery* 523; 32 km NNW of Mt Windarra, 29 Sep. 1992, *G.J. Keighery* 13901; 45 km N of Everard Junction, Gibson Desert Nature Reserve, 13 Aug. 1987, *D.J. Pearson* 245. NORTHERN TERRITORY: 9.8 miles [16 km] SW of Lucy Creek Homestead, 11 July 1957, *G. Chippendale* 3517; 55 miles [89 km] SW of Alice Springs, 16 Mar. 1953, 11672, *C.A. Gardner* 11672; Palm Creek campground, 2 Aug. 1981, *A.S. Weston* 12515; 70 miles [113 km] SE of Ringwood, 6 Oct. 1954, *R.E. Winkworth* 657.

Distribution. Occurs in the eastern Eremean Botanical Province of Western Australia, from near Mt Keith (south of Wiluna) and Mt Weld Station (south of Laverton) north-east to Petermann Ranges. Also occurs in Northern Territory, South Australia, Queensland and New South Wales. (Figure 3)

Habitat. Occurs on red sandy soils, often with spinifex (*Triodia*). Apparently favoured by fire.

Phenology. Flowering and fruiting period: July to October. In far inland areas of Western Australia, the species probably has a longer flowering period than currently recorded for the State, varying greatly

from year to year depending upon when sufficient rainfall comes. Its flowering period in other states includes March.

Chromosome number. n=11 (Keighery 1982b). Voucher specimens: *G.J. Keighery* 507, 523.

Conservation status. Not considered to be at risk.

Notes. Judging from flora accounts from other states (cited below), *T. glaucifolia* is up to 1 m high and can be perennial, although Western Australian specimens appear to be uniformly annual and the species is recorded as annual in the only available revision (Maconochie 1980: 174). Glandular hairs are present on the bracts and bases of peduncles and sometimes on the leaves in all Western Australian specimens, as indicated also for South Australian specimens (Eichler 1986: 1007) and all regions covered in the central Australian flora (Boyland & Stanley 1981: 270). According to Holland (1991: 401) the species has completely glabrous stems in Queensland, but presumably this is excluding the hairs on the peduncles, and also has completely glabrous leaves.

There are no mature fruits on the Western Australian specimens but the immature fruits are glabrous, lacking the small marginal glandular hairs present on both immature and mature fruits in most Northern Territory specimens. In addition to the minute glandular cilia, immature fruits of Northern Territory specimens have small glandular hairs scattered over the body which develop into tubercles as the fruit matures. Mature monocarps are mostly 4.5–6 x 4–4.8 mm, with a marginal wing 0.1–0.3 mm wide.

Trachymene pilbarensis has been included under this species and there are possibly other taxa still included in eastern material that need to be recognized at some level. *T. glaucifolia* certainly needs further study.

Trachymene grandis (Turcz.) Rye, *comb. nov.*

Dimetopia grandis Turcz., (Turczaninow 1849: 29). – *Didiscus grandis* (Turcz.) F. Muell. (Mueller 1859: 238). – *Didiscus benthamii* f. *tuberculatus* Domin (Domin 1908: 40). *Type:* Swan River Colony [Western Australia], 1847?, *J. Drummond* coll. 4, n. 133 (*holo:* KW *n.v.*, photograph PERTH; *iso:* MEL).

Trachymene sp. A in Wheeler (1987: 515).

Annual herb 0.2–2.5 m high, sometimes slightly viscid; indumentum (where present) of patent glandular hairs, but glandular apex sometimes lost with age. Stems usually largely glabrous but with hairs fairly densely distributed for some distance above each node, and often also for a shorter distance below each node, sometimes with scattered hairs on the usually glabrous portion; hairs 0.3–0.6(1.2) mm long, slender. *Cotyledons c.* 10 x 1.5–2.5 mm; blade narrowly ovate. *Petioles* 4–60 mm long; expanded base 1–5 mm long, with cilia up to 2 mm long. *Leaf blades* very broadly to depressed obovate in outline and 13–70 x 17–85 mm, deeply divided into narrow lobes, with a short base divided into 3 primary lobes, which are trisected or bisected with the secondary lobes further divided, most lobes more or less linear to filiform, usually with some hairs along the main veins. *Involucral bracts* 13–26; base 0.6–1.7 mm long; free portion 4–10(12) mm long, sparsely glandular-ciliate, the cilia mostly 0.1–0.4 mm long. *Peduncles* 25–95 mm long, usually glabrous for most of length but densely glandular-hairy at the base. *Umbels* mostly 15–30 mm diam. but up to 40 mm, 40–150(200)-flowered. *Pedicels* 1.5–16 mm long, the outermost ones 7–16 mm long in fruit. *Petals* 1.8–3.3 mm long, white to deep blue on both surfaces, the blue colour often mainly towards base.

Anthers 0.3–0.5 mm long. *Fruit* highly bilaterally compressed, with the outer monocarp very reduced and 2–3 mm long; styles 1.4–1.8 mm long. *Fertile monocarp* 3.0–4.0(5.0) x 2.0–2.8(3.6) mm, up to *c.* 0.8 mm thick, either bristly or tuberculate to almost smooth; bristles (0.3)0.4–0.6 mm long, retrorsely barbed; tubercles discrete, usually 0.1–0.2 mm long. (Figure 5I–L)

Specimens examined (bristly-fruited variant). WESTERN AUSTRALIA: Walpole–Nornalup National Park, 16 Dec. 1988, *A.R. Annels* 621; Mt Chudalup, 12 Dec. 1961, *T.E.H. Aplin* 1427; Porongorup Range, 15 Nov. 1994, *S. Barrett* 323; Ellis Brook Valley Reserve, 22 Dec. 1996, *H. Bowler* 476; Mt Chudalup, 26 Nov. 1961, *A.S. George* 3205; Crowea Rd, N of Northcliffe, 10 Jan. 1995, *E.D. Kabay* 1347; 2 km NNE of the intersection of Williamson Rd and Claymore Rd, 18 km E of Busselton, 15 Oct. 1992, *B.J. Keighery & N. Gibson* 729; 7 miles [13 km] W of Denmark, 27 Dec. 1973, *G.J. Keighery* 1412, 1414; 7 miles [13 km] W of Denmark, 12 Jan. 1974, *G.J. Keighery* 2152; 15 km NE of Denmark to Mount Barker, 13 Jan. 1984, *G.J. Keighery* 6528; Mt Chudalup, 19 Jan. 1966, *F. Lullfitz* 4714; William Bay National Park, Jan. 1984, *C.V. Malcolm* 77; 5 km E of Walpole, 19 Dec. 1982, *A. Strid* 21805; E of Waroona, Jan. 1964, *W.A. Ross.*

Specimens examined (with both variants or intermediate). WESTERN AUSTRALIA: Porongurup Range, Jan. 1941, *F.M. Bennett* (same sheet); 25 km N of Walpole Rd, Walpole, 3 Jan. 1986, *E.J. Croxford* 4750 (same sheet); Nornalup, Dec. 1929, *W.E. Blackall* (separate sheets); N part of Porongurup National Park, 1.5 km W of ranger's residence, 21 Oct. 1991, *W. Greuter* 23055.

Specimens examined (typical variant). WESTERN AUSTRALIA: Isle Rd, Walpole, 2 July 1997, *A.R. Annels* 5949; *c.* 3 km N of Crystal Springs, NW of Walpole, 13 Jan. 1978, *A.S. George* 15063; John Ratc Lookout, near Walpole, 27 Dec. 1973, *G.J. Keighery* 1413; Nornalup townsite, 12 Jan. 1974, *G.J. Keighery* 2153; 9.5 miles [15 km] N of Pemberton, 12 Jan. 1974, *G.J. Keighery* 2154; Bow River, Dec. 1912, *S.W. Jackson*; William Bay National Park, Jan. 1984, *C.V. Malcolm s.n.*; Walpole–Nornalup National Park, Delta Rd, 2.8 km W from Isle Rd, 27 Jan. 1993, *J.R. Wheeler* 3793 *& S.J. Patrick.*

Distribution. Endemic to the South West Botanical Province of Western Australia. Extends along ranges near the west coast from Ellis Brook Valley Reserve, in the Darling Range near Perth, south to near Jarrahwood and also extends along the south coast and nearby from Pemberton and Mt Chudalup east to the Porongurup and Stirling Ranges. (Figure 3)

Habitat. Apparently occurs in seasonally wet habitats in the western part of the species range, recorded from a creek bank in Jarrah (*Eucalyptus marginata*) forest and from slopes over granite or ironstone. In the southern part of its range, *T. grandis* occurs mainly in heavy soils in Karri (*Eucalyptus diversicolor*) forest or over granite.

Phenology. Flowering and fruiting period: October to early February, especially December to January. The species is favoured by fires and clearance.

Chromosome number. n=22 (Keighery 1982b). Voucher specimens: *G.J. Keighery* 1412–1414, 2152–2154 [all as *Trachymene anisocarpa*].

Conservation status. Not considered to be at risk.

Notes. The phrase name *Trachymene* sp. Walpole (*A.S. George* 15063) has been applied to this species. *Trachymene grandis* differs in chromosome number from its closest relative *T. anisocarpa* and has

larger fruits, invariably with one monocarp very reduced. The fertile monocarp also differs in ornamentation, being either smooth to tuberculate (the tubercles quite distinct, not combined into ridges as in *T. anisocarpa* var. *anisocarpa*) or bristly with numerous side branches especially towards the apex (not with side branches absent or mainly towards the base as in *T. anisocarpa* var. *trichocarpa*).

Trachymene grandis shows a great deal of variation in fruit ornamentation. A variant with bristly fruits occurs throughout the species distribution. Smooth-fruited plants are rarest and apparently restricted to the extreme south coast, while tuberculate-fruited plants, which include the type of the species, have been recorded mainly on the south coast but also further inland near Pemberton and on Porongurup Range. Specimens with tuberculate or smooth fruits appear to completely intergrade and are combined under the title 'typical variant' in the above lists of specimens examined. A few specimens (e.g. *G.J. Keighery* 1413 from near Walpole) have fruits that are intermediate between the bristly and tuberculate variants, these having long tubercles minutely barbed towards the apex. Two collections, *E.J. Croxford* 4750 from near Walpole and *F.M. Bennett s.n.* from Porongurup Range, are mixed, both with one plant of each fruit type. Presumably, these specimens come from mixed populations, as there are no morphological differences evident except for the terminally barbed tuberculate protrusions of one being replaced by the much longer bristles of the other.

Drummond's fourth collection was mainly from the region extending from Stirling Range south to King George Sound and east to West Mt Barren (Erickson 1969). The type collection was therefore probably from the easternmost part of the species range, perhaps from Porongurup Range. As its name suggests, *T. grandis* is usually a large plant; in Karri forests, where it commonly occurs, it reaches up to 2.5 m high. Where it grows on granite, however, it is a much smaller plant commonly *c.* 0.4 m high as in the Porongurup Range specimen *W. Greuter* 23055.

Trachymene oleracea (Domin) B.L. Burtt (Burtt 1941: 46). – *Didiscus oleraceus* Domin (Domin 1928: 1044–1045). *Type:* between Ashburton and De Grey Rivers, Western Australia, *E. Clement* (*syn: n.v.*); Mons Cupri, Whim Creek, Western Australia, *W.A. Mitchell* (*syn: n.v.*).

Annual herb usually 0.2–1.3 m high; indumentum (where present) of patent glandular hairs. *Cotyledons* 7–13 x 2.5–6 mm; lamina obovate. *Petioles* 20–60 mm long; expanded base 2.5–4.5 mm long, with cilia up to 3 mm long. *Leaf blades* broadly to depressed ovate in outline and shallowly to very deeply lobed, 15–40 x 22–55 mm, often with 3 primary lobes, all or the two lateral lobes often shallowly to deeply 2-lobed, prominently dentate, often with a few minute marginal hairs and a few larger hairs scattered along the veins; base generally with margins incurved into an open cone shape. *Peduncles* usually 20–170 mm long, subtended by stem-clasping, somewhat fan-shaped bracts. *Involucral bracts* 11–16; base 0.5–1.5 mm long; free portion 2.5–8 mm long, with few to many glandular cilia 0.1–0.5 mm long. *Umbels* mostly 10–30 mm diam., approximately 50–110-flowered. *Pedicels* 1–12 mm long; outermost ones 4–12 mm long in fruit, glabrous. *Petals* commonly 1.4–1.7 mm long, usually tinged deep blue to purple on undersurface, white or rarely very pale blue on upper surface. *Fruit* highly bilaterally compressed, the outer monocarp very reduced and 2.2–2.8 mm long; styles 1.5–2.5 mm long. *Fertile monocarp* with a very narrow to moderately broad wing around free margin; body 4.3–7.5 x 3.8–5.5 mm, up to *c.* 0.5 mm thick, tuberculate or papillate; wing 0.1–0.8 mm wide.

Distribution. Apparently endemic to Western Australia, extending from near Wyndham in the Northern Botanical Province south-west to Barlee Range in the Eremean Botanical Province. This is the only species to occur in more than one botanical province in Western Australia.

Notes. This species can generally be distinguished readily from other Western Australian species by its rather stem-clasping fan-shaped leaves. A species from Northern Territory, *T. inflata* Maconochie, has similar leaves but very different flowers and fruits.

Two subspecies are recognized in *Trachymene oleracea*. The subspecies appear to be geographically distinct, with subsp. *sedimenta* occurring further north than subsp. *oleracea*.

a. Trachymene oleracea (Domin) B.L. Burtt subsp. **oleracea**

Illustration. Wheeler (1992: Figure 211G).

Annual herb usually 0.2–1.3 m high, appearing glabrous. *Stems* glabrous. *Leaf blades* usually with a few large glandular hairs 0.3–2.2 mm long towards base and some minute glandular hairs towards apex of each tooth. *Involucral bracts* with a few glandular cilia 0.1–0.2(0.3) mm long. *Anthers* 0.35–0.5 mm long. *Fertile monocarp* with a body 4.3–6.7 x 4.0–5.5 mm, with thick tubercles, the largest tubercles 0.1–0.25 mm long; wing 0.1–0.3(0.4) mm wide.

Selected specimens examined. WESTERN AUSTRALIA. Northern Botanical Province: Wallal Downs Station, Eighty Mile Beach, 20 July, *N.T. Burbidge* 1497; 10 km NE of Nita Downs Station, 8 Oct. 1984, *P.R. Foulkes* 24; Mt Barrett, 11 May 1951, *C.A. Gardner* 10194; 9 km S of Ardjorie Homestead ruins, Edgar Ranges, 27 June 1984, *K.F. Kenneally* 9159.
Eremean Botanical Province: 7 km E of Wittenoom on the Roy Hill road, 11 Sep. 1982, *L.A. Craven* 7544; Bam Hill, Thangoo Station, 26 June 1991, *T. Handasyde* 13; Python Pool, Chichester Range National Park, 22 May 1976, *G.J. Keighery* 772; *c.* 30 km S of Munjina Roadhouse on Newman road, 3 Sep. 1995, *A.A. Mitchell* PRP620; Barlee Range, Henry River, 17 Aug. 1961, *R.D. Royce* 6512; West Lewis Island, Dampier Archipelago, 14 June 1962, *R.D. Royce* 7432; Rosemary Island, Dampier Archipelago, Aug. 1961, *B. Wilson* 9; Rudall River area, 12 Aug. 1971, *P.G. Wilson* 10457.

Distribution. Apart from an isolated record from Mt Barrett, near Halls Creek (Fitzgerald District), the known range is from near Broome and Edgar Ranges (Dampier District) in the Northern Botanical Province south-east to Dampier Archipelago and Barlee Range and south to Well 24 of Canning Stock Route in the Eremean Botanical Province of Western Australia. (Figure 2)

Habitat. Occurs mainly in rocky or stony habitats, the rock type often ironstone, sometimes on the slopes and summits of hills or along watercourses, often in red soil with spinifex (*Triodia*).

Phenology. Flowering and fruiting period: May to October, also one record from early March.

Chromosome number. n=11 (Keighery 1982b). Voucher specimen: *G.J. Keighery* 772.

Conservation status. Widespread and common.

Notes. The leaves are usually glandular-hairy but a few specimens, especially some from islands of Dampier Archipelago and from the Kimberley region, have glabrous or subglabrous leaves.

b. Trachymene oleracea subsp. **sedimenta** Rye, *subsp. nov.*

Differt a *Trachymene oleracea* subsp. *oleracea* indumento densiore et plus generali, ala fructi latiore et tuberculis fructi longioribus insidens.

Typus: Napier Range, Western Australia, 24 May 1971, *D.E. Symon* 7015 (*holo:* PERTH (ex ADW) 03582515; *iso:* ADW, CANB, K all *n.v.*).

Annual herb commonly 0.3–0.6 m high, with an indumentum of short glandular hairs on the young stems, leaves and bracts. *Stems* rather densely hairy, the larger hairs 0.4–0.9 mm long. *Leaf blades* moderately densely hairy throughout, the larger hairs mostly 0.3–0.5 mm long. *Involucral bracts* with many glandular hairs, the larger ones 0.3–0.5 mm long. *Anthers* 0.5–0.6 mm long. *Fertile monocarp* with a body 4.5–7.5 x 3.8–5.5 mm, with long tubercles towards apex and/or inner margin and shorter tubercles elsewhere; wing 0.5–0.8 mm wide at apex of fruit body and 0.4–0.5 mm wide around remainder of body; larger tubercles slender, 0.4–0.6 mm long. (Figure 7A–D)

Figure 7. A–D. *Trachymene oleracea* subsp. *sedimenta*. A – flowering and fruiting branch (x1), B – young stem and leaf (x3.5), C – asymmetric fruit from Napier Range (x4.5), D – asymmetric fruit from Wyndham (x4.5); E–G. *T. villosa*. E – stem and leaf (x1), F – fruiting inflorescence (x1), G – asymmetric fruit (x3.5). Drawn from *C.A. Gardner* 7255 (A,D), *D.E. Symon* 7015 (B,C) and *R.A. Perry* (E–G).

Other specimen examined. WESTERN AUSTRALIA: The Bastion Range, near Wyndham, 24 May 1944, *C.A. Gardner* 7255.

Distribution. Recorded from Napier Range (Dampier District near border with Fitzgerald District) and The Bastion Range, near Wyndham (eastern Gardner District) in the Northern Botanical Province of Western Australia. (Figure 2)

Habitat. Occurs on limestone or sandstone on inland ranges, the limestone on Napier Range being of Devonian reef origin.

Phenology. Flowering and fruiting period: May to June.

Conservation status. CALM Conservation Codes for Western Australian Flora: Priority One. Known from two collections made in two ranges of hills over 400 km apart.

Etymology. The epithet refers to the sedimentary rocks on which the taxon has been found.

Notes. Attention was first drawn to the existence of distinctly glandular-hairy specimens in a note under the description of *Trachymene oleracea* in "Flora of the Kimberley Region" (Wheeler 1992: 685) and the taxon was later added to the Priority Flora List under the phrase name *Trachymene* sp. Napier (*D.E. Symon* 7015).

Subspecies *oleacea* differs from subsp. *sedimenta* in its glabrous stems, less densely hairy leaves, fewer and shorter cilia on the bracts, shorter papillae and narrower wing on the fruit, and possibly shorter anthers. In subsp. *sedimenta*, the hairs on the leaves are more uniform in size than in subsp. *oleracea*, which tends to have both minute hairs and much larger hairs.

Trachymene pilbarensis Rye, *sp. nov.*

?*Didiscus setulosus* var. *fililoba* F. Muell. (Mueller 1883: 14). *Type:* none cited but the immature material described apparently came from the Gascoyne River area or nearby in Western Australia.

Trachymene glaucifoliae affinis sed divisionibus foliorum angustioribus, pedunculis glabris et alis fructorum latioribus differt.

Typus: 3 km north of Mt Narryer, Western Australia, 2 September 1970, *R.A. Saffrey* 1160 (*holo:* PERTH 03581896; *iso:* CANB, K, MEL).

Annual herb usually 0.1–0.7 m high, often purplish on base of stem and undersurface of cotyledons; indumentum (where present) of antrorse to patent glandular hairs, sometimes losing glandular apex with age. *Stems* glabrous. *Cotyledons* 12–26 x 3.5–10 mm; lamina obovate to broadly ovate. *Petioles* 15–80 mm long; expanded base usually 2–5 mm long, with cilia up to 4 mm but usually 1–3 mm long. *Leaf blades* broadly to depressed ovate in outline and very deeply divided into very narrow lobes, 12–70 x 10–90 mm, the 3 primary lobes usually further trisected or bisected, often with secondary lobes also divided, usually with a few hairs scattered along the veins. *Peduncles* 10–90 mm long, glabrous. *Involucral bracts* 12–20; base 0.5–1.3 mm long; free portion 2–9 mm long, glandular-ciliate, the longer cilia 0.5–1.3 mm long. *Umbels* 12–27(35) mm diam., approximately (15)20–100-flowered. *Pedicels* 3–13 mm long, the inner and outer ones not greatly differing in length, glabrous. *Flowers* with blue

and/or purple tints, the stylopodium and styles often deep blue to violet. *Petals* 2–3 mm long, usually white or pale blue on upper surface and blue to violet on undersurface. *Anthers* 0.4–0.6 mm long. *Fruit* highly bilaterally compressed, with the outer monocarp very reduced and 1.7–2.5 mm long; styles 2–2.5 mm long. *Fertile monocarp* with a body 4.8–5.7 x 4.2–5.3 mm and very narrow wing around margin, up to *c.* 0.6 mm thick, smooth or tuberculate; wing 0.1–0.2 mm wide, entire, yellow-brown, translucent. (Figure 5B–E)

Selected specimens examined. WESTERN AUSTRALIA: Yanrey West, 8 Aug. 1963, *W.H. Butler;* Towera Station, 5 Aug. 1981, *R.J. Cranfield* 1772; 1.1 km SW of Murdabool Well, Belele Station, 26 Aug. 1986, *R.J. Cranfield* 5919; E side of Mt Augustus, 29 July 1989, *A.E. De Jong*; Pharoh Well, 19 Aug. 1972, *H. Demarz* 3841; Old Mooka Homestead, 2 Sep. 1983, *H. Demarz* 9649; Kennedy Range, 23 Sep. 1941, *C.A. Gardner* 6081; 10 miles [16 km] S of Onslow, 28 Aug. 1960, *A.S. George* 1146; 45 miles [72 km] E of Bullara Homestead, 29 Aug. 1960, *A.S. George* 1192; 28 km W of Erabiddy Homestead, 13 Sep. 1987, *J.W. Green* 5382; W side of Doolgunna Station, 1973, *J.G. Morrissey* 161; Barley Range Nature Reserve, 9.7 km W of Mt Palgrave, 5 Aug. 1993, *S. van Leeuwin* 1349; 7 km NW of Quarry Hill, 4 Aug. 1984, *K.R. Newbey* 10653; 17.5 km N of Barradale, 3 Oct. 1989, *B. Nordenstam & A. Anderberg* 289; near Ejah breakaway, Mileura Station, 30 Aug. 1970, *R.A. Saffrey* 1117; 10 miles [16 km] S of Berringarra, 15 July 1958, *N.H. Speck* 975; Landor Station, Sep. 1969, *D.G. Wilcox* 83.

Distribution. Occurs in the Pilbara–Gascoyne area in the Eremean Botanical Province of Western Australia. Extends from near Onslow south to Mt Narryer Station and inland to near Great Northern Highway. (Figure 3)

Habitat. Occurs on rocky hillsides, granite outcrops and other rocky sites, often in *Acacia* shrublands, commonly in reddish soils with spinifex (*Triodia*).

Phenology. Flowering and fruiting period: July to October.

Chromosome number. n=11 (Keighery 1982b). Voucher specimens: *H. Demarz* 3841 [as *Trachymene* sp. I], possibly also Dell 74886 *n.v.*

Conservation status. An apparently common species with a wide distribution.

Etymology. The epithet refers to the Pilbara area of Western Australia, where the species is widespread.

Notes. This species has been known by the phrase names *Trachymene* sp. Kennedy Range (*G.J. Keighery & N. Gibson* 719) and *Trachymene* sp. Pilbara (*R.A. Saffrey* 1117) and was previously referred to as *T.* sp. *aff. glaucifolia* in PERTH. It appears also to have been included as *Trachymene* sp. in "Flora of Central Australia" (Boyland & Stanley 1981: 270) although no PERTH specimens are from the region covered by that flora.

It is closely related to *Trachymene glaucifolia*, which differs in having small glandular hairs on the base of the peduncles, leaf blades basically obovate rather than ovate and with broader shallower divisions, and monocarps often with glandular hairs. *T. glaucifolia* also tends to have narrower cotyledons, shorter hairs and more numerous bracts and flowers, but these characters overlap too much to be useful for keying the two species.

Trachymene pyrophila Rye, *sp. nov.*

Trachymene anisocarpae affinis sed planta plus glanduloso pilosiore et fructis prominente setosis pedicellis longioribus insidens differt.

Typus: 15 km south-east of Cundeelee Mission, Western Australia, 3 December 1965, *D.W. Goodall* 2417 (*holo:* PERTH 03618277; *iso:* CANB).

Annual herb 0.1–0.5 m high, viscid; indumentum of patent glandular hairs. *Stems* moderately densely hairy; hairs mostly 0.2–1.0 mm long, usually stout. *Cotyledons* 6–7 x 1–1.5 mm; lamina narrowly ovate. *Petioles* mostly 11–35 mm long; expanded base 2.5–4.5 mm long, glandular-ciliate, often with large cilia or narrow marginal divisions 1.5–3 mm long (these usually with a few additional lateral glands or side branches each terminated by a gland) and smaller hairs on the outer surface and margins. *Leaf blades* very broadly to depressed obovate in outline and deeply lobed, 12–30 x 16–34 mm long, cuneate at base, the 3 primary lobes further trisected or bisected and dentate, the ultimate lobes short and 3–7 mm wide; lower surface prominently veined, each vein with glandular hairs; upper surface largely glabrous but with a few glandular hairs on main veins. *Bracts* usually 16–28; free portion 7–12 mm long in fruit. *Peduncles* 15–70 mm long, glandular-hairy throughout or rarely glabrous towards the summit. *Inflorescence* usually 40–120-flowered or larger; the outer flowers sometimes all producing asymmetric fruits but at least some of the inner flowers producing homomorphic fruits. *Pedicels* 2–16 mm long, glabrous; outermost ones 11–16 mm long in fruit. *Petals* 1.3–1.6 mm long, often pale to deep purple on undersurface, white on upper surface. *Anthers* 0.3–0.4 mm long. *Fruit* bilaterally compressed, with outer monocarp very to somewhat reduced or with both monocarps fully developed; carpophore 1.0–1.6 mm long; styles 1.5–2.5 mm long. *Fertile monocarp(s)* 2.3–2.6 x 1.7–1.8 mm, *c.* 0.5 mm thick, with long hair-like bristles, which are simple or slightly branched at base but not towards summit, the largest bristles 0.7–1 mm long. (Figure 4F–J)

Other specimens examined. WESTERN AUSTRALIA: Queen Victoria Springs, 26 Jan. 1959, *W.H. Butler*; Ponton Creek, N of Zanthus, 10 Nov. 1963, *A.S. George*; 7 km SW of Nippon Junction, Queen Victoria Springs Nature Reserve, 26 Nov. 1986, *D.J. Pearson* 93; 50 km NNE of Streich Mound, 24 Mar. 1987, *D.J. Pearson* 1070.

Distribution. Occurs in the South-western Interzone of Western Australia. Extends from near Officer Basin south to Ponton Creek (north of Zanthus). (Figure 2)

Habitat. Recorded in yellow or orange sand on sandplains, one record from mallee (*Eucalyptus*) over spinifex (*Triodia basedownii*).

Phenology. Flowering and fruiting period: November to March. Germinates after fires or other disturbances.

Conservation status. CALM Conservation Codes for Western Australian Flora: Priority Two. Known from four collections, including one from Queen Victoria Springs wildlife sanctuary. This species rarely germinates in undisturbed vegetation but is reported to be frequent after fire and occasional after disturbance caused by mining. It has been listed as a priority species since 1995 under the phrase name *Trachymene* sp. Cundeelee (*D.W. Goodall* 2417).

Etymology. From the Greek *pyros* – fire and *phileo* – to love. Like related species, this taxon is favoured by fires.

Notes. Closely related to *Trachymene anisocarpa* but can be distinguished both vegetatively and in fruit. It tends to be a smaller plant and is always more hairy than *T. anisocarpa*, with glandular hairs more numerous and more widespread on the stems, bracts and leaves. It tends to have broader, more dentate leaf divisions and its petioles tend to be broader and more prominently divided at the base. Its fruit is very similar to that of *T. anisocarpa* var. *trichocarpa* except that var. *trichocarpa* has shorter bristles 0.2–0.4 mm long. In fruit, the pedicels and styles are generally significantly longer in *T. pyrocarpa* than in both varieties of *T. anisocarpa.*

2. Trachymene sect. **Hemicarpus** (F. Muell.) Rye, *comb. nov.*

Didiscus sect. *Hemicarpus* (F. Muell.) F. Muell. (Mueller 1859: 237). – *Hemicarpus* F. Muell. (Mueller 1857: 18). *Type: Henicarpus didiscoides* F. Muell. [= *Trachymene didiscoides* (F. Muell.) B.L. Burtt], lectotype here chosen.

Didiscus II. *Pseudocalycina* Domin, rank not specified (Domin 1908: 28). *Type: Didiscus hemicarpus* F. Muell. [= *Trachymene didiscoides* (F. Muell.) B.L. Burtt], lectotype here chosen.

Perennial or *annual herbs* or *subshrubs* medium-sized to large; indumentum (where present) of antrorse to patent non-glandular hairs, which are usually long and often dendritic. *Petioles* with enlarged base tapering to, and scarcely differentiated from, the remainder of petiole. *Flowers* usually yellow to white on the upper surface of the petals, often suffused deep pink on the outside, and deep pink to red in the centre (particularly the stylopodium and styles), occasionally also pink on the pedicel. *Sepals* 5 but usually very unequal, with the apex distinctly capitate-clubbed, the largest sepal prominent on the young fruits and either elongate or strongly clubbed. *Petals* small or medium-sized. *Fruit* usually of 1 monocarp with a wing around the margin.

Etymology. Derived from the Greek *hemi* – half and *carpos* – fruit, members of this section producing mostly half-sized fruits with only one monocarp fertile.

Notes. A section comprising at least seven species in Western Australia and Northern Territory, possibly with further species in the Malesian region or eastern Australia. Three members of this section that are endemic to Northern Territory are *T. hispida* Maconochie, *T. lacerata* Maconochie and *T. rotundifolia* Maconochie, all described and illustrated in Maconochie (1980). A comprehensive treatment of Malesian species of *Trachymene* is given in Buwalda (1949).

In sect. *Hemicarpus* the sepals are more prominent than in sect. *Didiscus*, the largest sepal sometimes about 2 mm long in late flower or early fruit, but shorter by the time the fruit matures, when it is typically 0.3–1.5 mm long. Some plants produce only asymmetric fruits and others, often in the same species, produce both asymmetric and homomorphic fruits.

Trachymene dendrothrix Maconochie (Maconochie 1980: 184–185). *Type:* Gibb River crossing, Western Australia, 28 May 1971, *J.R. Maconochie* 1223 (*holo:* PERTH 01597329; *iso:* BRI, K, NT, isotypes all *n.v.*).

Illustrations. Maconochie (1980: Figure 6); Wheeler (1992: Figure 211C).

Annual or *short-lived perennial herb* 0.5–2.5 m high; indumentum (where present) of dendritic non-glandular hairs. *Stems* sometimes slightly glaucous, glabrous. *Cotyledons c.* 8 x 4 mm; lamina more or less ovate. *Petioles* 30–85 mm long, usually rather densely hairy but sometimes largely glabrous; hairs often mostly *c.* 0.4 mm long but with scattered cilia 1–2.5 mm long especially at base of petiole. *Leaf blades* broadly to depressed ovate or obovate in outline and shallowly to deeply lobed, 30–65 x 25–85 mm, often cuneate at base, the 3 primary lobes broad or sometimes narrow, each usually further trisected or bisected or dentate, fairly densely to sparsely hairy; larger hairs 0.4–1.2 mm long. *Peduncles* 20–80 mm long, glabrous. *Involucral bracts* 13–18; base 0.7–1.7 mm long; free portion 2.5–6 mm long, glabrous. *Umbels* mostly 10–25 mm diam., approximately 50–200-flowered, all flowers or just the outer flowers producing asymmetric fruits or rarely both inner and outer flowers producing homomorphic fruits. *Pedicels* 1–12 mm long; outermost ones 4–12 mm long in fruit, glabrous. *Petals c.* 1.0 mm long, cream or yellow on upper surface, often reddish on undersurface. *Anthers c.* 0.4 mm long. *Fruit* highly bilaterally compressed, either with the outer monocarp very to somewhat reduced and 1.6–3.3 mm long or with both monocarps fully developed; carpophore 1.4–2.3 mm long; largest sepal 0.4–0.6 mm long; styles 0.8–1.5 mm long. *Fertile monocarp(s)* 3.4–4.3 x 2.3–3 mm including a slight to definite wing up to 0.4 mm wide, up to *c.* 0.5 mm thick, tuberculate; tubercles up to 0.25 mm long.

Selected specimens examined. WESTERN AUSTRALIA: Bindoola Creek, El Questro–Gibb River road, 27 May 1976, *A.C. Beauglehole* 51375; near junction of Hann and Barnett Rivers, June 1905, *W.V. Fitzgerald* 1101; just W of Traine River, Mt House–Tableland road, 19 June 1978, *A.S. George* 15175; summit of Mt Trafalgar, 2 May 1996, *G. Graham* 43; King Edward River, *c.* 100 km S of Kalumburu, 4 June 1987, *G.J. Keighery* 8997; Camp Creek, Mitchell Plateau, 13 June 1976, *K.F. Kenneally* 4792; 7.0 km NE of Beverley Springs Homestead, 19 May 1979, *B.G. Muir et al.* 694; Gibb River crossing, *c.* 40 km N of Gibb River Homestead, 28 May 1971, *D.E. Symon* 7077; Bat Island, Bonaparte Archipelago, 26 June 1973, *P.G. Wilson* 10988.

Distribution. Endemic to the Northern Botanical Province of Western Australia. Extends from Mitchell Plateau south to Hann River and from Bonaparte Archipelago east to Bindoola Creek (west of Pentacost Range). (Figure 1)

Habitat. Occurs on sandstone, often in eucalypt woodlands. The species is common after burns.

Phenology. Flowering and fruiting period: April to August.

Conservation status. Not considered to be at risk.

Notes. Closely related to *T. didiscoides* and *T. dusenii*, both of which apparently tend to be more long-lived species. There is some doubt that *T. dendrothrix* is distinct from *T. didiscoides* as discussed under the latter species. The original description of *T. dendrothrix* (Maconochie 1980: 184) suggests that the species is most closely related to *T. dusenii*, but *T. dusenii* is readily distinguished from all the other species in the Kimberley region.

Trachymene didiscoides (F. Muell.) B.L. Burtt (Burtt 1941: 46). – *Hemicarpus didiscoides* F. Muell. (Mueller 1857: 18). – *Didiscus setulosus* F. Muell. *nom. illeg.* (Mueller 1859: 238). – *D. hemicarpus* F. Muell. *nom. illeg.* (Mueller 1863: 226). – *Trachymene hemicarpa* (F. Muell.) Benth. (Bentham 1867: 351). – *Trachymene setulosa* (F. Muell.) Druce (Druce 1917: 650). *Type:* Providence Hill, [Northern Territory], *F. Mueller* (*lecto:* K *n.v., fide* Maconochie (1980: 172)).

Illustration. Wheeler (1992: Figure 211D).

Perennial herb 0.5–2.5 m or more high, often somewhat glaucous; indumentum (where present) of slender spreading non-glandular hairs, the juvenile leaves sometimes with dendritic hairs and the mature leaves with unbranched hairs. *Stems* glabrous. *Cotyledons* 5.5–8 x 3–5 mm; lamina ovate to obovate. *Petioles* 30–160 mm long, usually with a few large cilia at the base, rarely with cilia throughout basal half or even 1 or 2 cilia occurring in distal half; cilia 2–6 mm long. *Leaf blades* broadly to depressed obovate in outline and shallowly to very deeply lobed or divided into 3 or 5 petiolulate leaflets, 35–100 x 40–150 mm, the primary lobes or leaflets usually 2- or 3-lobed or sometimes deeply divided and the secondary lobes or leaflets further divided, toothed, glabrous or with hairs 1–5 mm long scattered along the veins; petiolules up to 35 mm long. *Peduncles* 10–90 mm long, glabrous. *Involucral bracts* 12–21; base 0.8–1.7 mm long; free portion 2.5–14 mm long, very slender, glabrous. *Umbels* mostly 10–25 mm diam., approximately 40–170-flowered, all flowers producing asymmetric fruits or some to most producing homomorphic fruits, the inner flowers producing homomorphic fruits more frequently than the outer flowers. *Pedicels* 1–15 mm long; outermost ones 4–15 mm long in fruit, glabrous. *Petals* 0.8–1.2 mm long, white to yellow on upper surface, often flushed deep pink on undersurface. *Anthers* 0.35–0.45 mm long. *Fruit* highly bilaterally compressed, either with the outer monocarp very to somewhat reduced and 1–2.7 mm long or with both monocarps maturing; carpophore 0.8–2.4 mm long; largest sepal usually 0.2–0.8 mm long but up to 1.7 mm long on young fruits; styles 1.3–1.6 mm long. *Fertile monocarp(s)* 2.6–4.8 x 2.3–3.6 mm, up to *c.* 0.4 mm thick, slightly to prominently tuberculate; wing usually 0.1–0.2 mm but up to 0.4 mm wide; tubercles up to 0.2 mm long.

Selected specimens examined (typical variant). WESTERN AUSTRALIA: Bougainville Peninsula, 22 May 1993, *I. Cowie* 4210 & *Stewart*; Koolan Island, 2 May 1983, *P.A. Fryxell & L.A. Craven* 3915; Prince Regent River, 4 June 1920, *C.A. Gardner* 1350; Cape Bernier, 5 June 1988, *G.J. Keighery* 10102; Bathurst Island, Buccaneer Archipelago, 24 June 1982, *K.F. Kenneally* 8505; Boomerang Bay, Bigge Island, 3 June 1972, *N.G. Marchant* 72/113; rocky crossing at Theda Station Homestead, 29 May 1971, *D.E. Symon* 7116.

Selected specimens examined (inland variant). WESTERN AUSTRALIA: Donkey Creek, Beverley Springs Station, 19 Jan. 1992, *R.L. Barrett* 122; road to Carlton Hill Station, *c.* 50 km NW or NNW of Kununurra, 27 Apr. 1977, *H. Eichler* 22522; Gauging Station, Camp Creek, *c.* 12 km SW of mining camp, Mitchell Plateau, 7 Dec. 1982, *K.F. Kenneally* 8672; just N of Eva Creek Gorge, King Leopold Ranges, 12 June 1992, *M.J.S. Sands* 4618.

Selected specimens examined (narrow-leaved variant). WESTERN AUSTRALIA: 6 km WNW of One Arm Point, 13 June 1987, *B.J. Carter* 41; 7.6 km W of Deep Water Point, 24 June 1981, *K.F. Kenneally* 7657; Sir Frederick Island, Buccaneer Archipelago, 27 June 1982, *L.J. Pen* 33.

Distribution. Occurs in the Northern Botanical Province of Western Australia, extending along the north-west coast and offshore islands from near Cape Leveque north-east to Cape Bernier and inland to Camballin, the King Leopold Ranges and Carlton Hill Station. Also occurs in Northern Territory. (Figure 3)

Habitat. Often occurs on sandstone outcrops and other sandstone habitats, also on other types of rocky habitats such as lateritic plateaus, with a variety of dominant species including eucalypts and *Acacia* species. Mostly recorded on islands and close to the coast of the mainland but with scattered records inland.

Phenology. Flowering and fruiting period: most or all of the year but particularly May to July.

Conservation status. Not considered to be at risk.

Notes. This appears to be the largest of the *Trachymene* species in Western Australia, sometimes equalled in height by one or two other species but rarely in bulk. A few of the smaller specimens of *T. didiscoides* appear to be annual rather than perennial but these may just be young plants, many of which probably do not succeed in becoming established as mature plants. The juvenile leaves sometimes (e.g. in *P.A. Fryxell et al.* 4687) have dendritic hairs like those of *T. dendrothrix* on the petiole but are not as densely hairy and have only scattered long hairs on the blade. In all cases the mature basal leaves have a few long unbranched hairs on the base of the petiole and sometimes scattered on the veins, with the upper leaves mostly completely glabrous. Apart from the difference in leaf indumentum, no absolute differences have been found between *T. didiscoides* and *T. dendrothrix*. The two taxa often cannot be distinguished from herbarium specimens that lack the basal parts of the plants as there appear to be no reliable differences in their flowers and fruits.

As presently delimited, *Trachymene didiscoides* is extremely variable, having three main variants. The typical variant is found mainly close to the coast and on off-shore islands from Buccaneer Archipelago around the north of the Kimberley and in the north of Northern Territory. It is a large plant with deeply dissected leaves, the larger leaves usually with petiolulate leaflets, and has large umbels and fruits. A narrow-leaved variant, which extends from near Cape Leveque north-east to Sir Frederick Island, appears to be a smaller plant that might be more short-lived. Another small variant extends inland to the King Leopold Ranges but does not reach the coast and has less deeply divided leaves with the leaflets not petiolulate. This inland variant shows the greatest similarity to two other predominantly inland taxa, *T. dendrothrix* and *T. microcephala*. All these taxa are in need of further study, particularly of the different stages from the seedling to full-sized plant, to reassess the formal taxonomy of this group. They also need to be compared with the variants and related species occurring in Northern Territory.

Trachymene dusenii (Domin) F.M. Bailey (Bailey 1913: 228). – *Didiscus dusenii* Domin (Domin 1908: 64–65). *Type:* near Cambridge Gulf, [Western Australia], *Johnston* 1885 (*iso:* K, MEL, both *n.v.*).

Didiscus setosus O. Schwarz (Schwarz 1927: 92) – *Trachymene setosus* (O. Schwarz) B.L. Burtt (Burtt 1941: 46). *Type:* Port Darwin, Northern Territory, *Bleeser* 347 (*holo:* B, ? destroyed).

Illustration. Wheeler (1992: Figure 211E).

Perennial herb 0.5–1 m or more high, forming clumps; indumentum (where present) of patent non-glandular dendritic hairs. *Stems* glabrous. *Cotyledons* not seen. *Petioles* 25–60 mm long, with a very dense indumentum of mixed hairs of very varied lengths, the largest hairs 2–8.5 mm long. *Leaf blades* broadly or very broadly obtriangular to obovate in outline and slightly to deeply 3-lobed, 14–55 x 23–45 mm, cuneate at base, each lobe shallowly to deeply toothed but not divided into secondary lobes, with an indumentum similar to that of the petiole but tending to be shorter and less dense, the largest hairs 2–4.5 mm long. *Peduncles* 15–95 mm long. *Involucral bracts* usually 14–21; base 1–2.5 mm long; free portion 5–13 mm long, glabrous. *Umbels* mostly 12–35 mm diam., usually approximately 40–200-flowered, the outer flowers all producing asymmetric fruits but the inner flowers sometimes producing homomorphic fruits. *Pedicels* 3–10 mm long; outermost ones 8–10 mm long in fruit, glabrous. *Petals c.* 1.5 mm long, yellow or white. *Anthers* 0.4–0.6 mm long. *Fruit* highly bilaterally

compressed, with the outer monocarp usually very reduced and 2–2.5 mm long; largest sepal 0.4–1.5 mm long; styles 1.6–2.3 mm long. *Fertile monocarp(s)* with a body 3.5–4.5 x 2.8–3.3 mm, up to *c.* 1 mm thick, minutely tuberculate, with a fairly broad wing around free margin; wing 0.7–1.2 mm wide, entire; tubercles up to 0.2 mm long.

Specimens examined. WESTERN AUSTRALIA: 13 miles [18 km] S from turnoff Halls Creek to Billiluna, 19 July 1968, *J.S. Beard* 5534; 43 km N of Ruby Plains Homestead, 15 July 1974, *A.C. Beauglehole & G.W. Carr* 3727; 95 km S of Halls Creek on the Tanami track, 26 May 1985, *P.A. Fryxell, L.A. Craven & J. McD. Stewart* 4542; 28 miles [45 km] N of Springvale Station, 20 July 1959, *M. Lazarides* 6373.
NORTHERN TERRITORY: Negri River, 3.5 km E of Duncan Highway, 7 July 1976, *A.C. Beauglehole* 54406; 22 miles [35 km] SSE of Waterloo Station, 2 July 1949, *R.A. Perry* 2319.

Distribution. Occurs in the Halls Creek area in the south-east of the Northern Botanical Province, extending from the north end of Springvale Station south to Ruby Plains Station. Also occurs in Northern Territory. (Figure 3)

Habitat. One record from *Eucalyptus brevifolia* "steppe woodland" and another from "coarse-textured skeletal soil on hill". In Northern Territory the species has been recorded from alluvial flats near small watercourses.

Phenology. Flowering and fruiting period: May to July.

Conservation status. CALM Conservation Codes for Western Australian Flora: Priority Three. Known from only four specimens in Western Australia and a small number of specimens from the adjacent part of Northern Territory.

Notes. Readily identified by its distinctive leaf indumentum from all other *Trachymene* species in Western Australia.

Trachymene microcephala (Domin) B.L. Burtt (Burtt 1941: 45). – *Didiscus microcephalus* Domin (Domin 1908: 56). *Type*: North Coast [probably Arnhem South Bay, Middle Point, Northern Territory], 1803, *R. Brown* (probable *holo:* K, *n.v.*; *iso:* W).

Didiscus pilosus Benth. *nom. illeg.* (Bentham 1837: 54), *non D. pilosus* (Sm.) Domin. *Type:* in Bauer Herbarium (*holo:* W).

Illustration. Wheeler (1992: Figure 211F).

Perennial herb 0.4–1 m high; indumentum (where present) of very fine spreading non-glandular hairs up to 6 mm long, occasionally pink. *Stems* glabrous or with a long hairs at or extending below or above the nodes. *Cotyledons* not seen. *Petioles* 20–70 mm long, with long hairs scattered along full length; hairs 2–5 mm long. *Leaf blades* broadly to depressed obovate in outline and usually slightly to deeply 3-lobed, 15–45 x 15–40 mm, cuneate at base, the primary lobes often further divided into 2 or 3 secondary lobes, all lobes dentate, with long hairs scattered along the veins. *Peduncles* 10–50 mm long. *Involucral bracts* 10–16; base up to 1 mm long; free portion 1.5–4 mm long, glabrous. *Umbels* mostly 8–16 mm diam., approximately 20–75-flowered, all flowers producing highly asymmetric fruits or rarely a few inner flowers producing homomorphic or only slightly asymmetric fruits. *Pedicels*

1.5–6 mm long; outermost ones 3–6 mm long in fruit, glabrous. *Petals* 0.9–1.2 mm long, yellow or white on upper surface, deep pink to reddish on undersurface. *Anthers* 0.3–0.4 mm long. *Fruit* highly bilaterally compressed, usually with the outer monocarp very reduced and 1.3–2.5 mm long; largest sepal 0.3–0.6 mm long; styles 0.7–1.4 mm long. *Fertile monocarp(s)* 3.3–4 x 2.4–2.6 mm, up to *c.* 0.6 mm thick, often with a narrow wing around free margin, usually minutely tuberculate; wing absent or up to 0.4 mm wide, entire; tubercles up to 0.2 mm long.

Selected specimens examined. WESTERN AUSTRALIA: 14.4 miles [23 km] NW of Mt Elizabeth Station, 30 June 1973, *T.E.H. Aplin* 5615; Chapman River, 55 km by road WSW of Kurungi Station turnoff Gibb River–El Questro road, 25 May 1976, *A.C. Beauglehole* 51557; Kununurra–Timber Creek road, 1.5 km W of Lake Argyle turnoff, *G.W. Carr* 3054 *& A.C. Beauglehole* 46833; Camp Creek, near Camp Amax, Mitchell Plateau, 29 May 1993, *I.D. Cowie* 4336 *& C. Brubaker*; 19 km ESE of Coulomb Point, Wonganut Spring Creek, 18 June 1984, *S.J. Forbes* 2379; King Edward River, *c.* 100 km S of Kalumburu, 5 June 1987, *G.J. Keighery* 9076; *c.* 13 km S of Paradise Pool on Ernest River, 20 Mar. 1978, *M. Lazarides* 8640; 13 miles [21 km] W of Durack River, 20 May 1967, *E.M. Scrymgeour* 1830. NORTHERN TERRITORY: 16 miles [26 km] E of Borroloola Station, 28 July 1948, *R.A. Perry* 1801.

Distribution. Occurs mainly in the north-western part of the Northern Botanical Province, extending from near Coulomb Point (north of Broome) north-east to near Port Warrender and east-north-east to Victoria Highway east of Ord River. Also occurs in Northern Territory. (Figure 2)

Habitat. Commonly occurs along watercourses, often in alluvial soils, or near swamps, often associated with *Corymbia polycarpa* or *Melaleuca viridiflora*. Also recorded in *Eucalyptus miniata* woodlands on sandstone or laterite.

Phenology. Flowering and fruiting period: March to October.

Chromosome number. The chromosome number of this species is unknown. Although (Wanscher 1933) recorded 2n=44 for *Didiscus pilosus* Benth., this name was then applied to many species that were lumped under the illegitimate name *T. australis*, as explained below. Wanscher's chromosome number determination almost undoubtedly came from material of a non-Western Australian member of that species group.

Conservation status. Not considered to be at risk at present.

Notes. Maconochie placed a determinavit dated 2 June 1977 on the holotype of *Didiscus pilosus* Benth., identifying the specimen as *Trachymene microcephala*, but did not mention this in his revision (Maconochie 1980). The name *D. pilosus* had generally been assumed to apply to one of the taxa occurring in the south-west of Australia, with both Bentham (1867) and Domin (1908) citing it under their illegitimate names of *T. australis* Benth. and *T. benthamii* Domin respectively.

As noted by Burtt (1941), Bentham (1867) cited the types of two previously named species, *Dimetopia anisocarpa* and *D. grandis* under *Trachymene australis*, and could have used one of these existing epithets rather than creating a superfluous new epithet. Interestingly, Bentham did not cite the type specimen of *Didiscus pilosus*, which he listed as a synonym and evidently was intending to replace by his new name, perhaps omitting the type because it was a poor specimen. Bentham could not make the new combination *Trachymene pilosa* (Benth.) Benth. because the name *T. pilosa* Sm. had already been published for another member of the genus. Bentham had based his description of

D. pilosus on a single vegetative specimen of the species now known as *Trachymene microcephala* and, since the specimen lacked a locality, he was evidently unaware that this was a species from northern Australia. Indeed he clearly regarded the northern taxon as a different species because be cited a specimen later used as the type of *T. microcephala* under the name *T. incisa* var. *pilosa* Benth. (Bentham 1867: 350).

Trachymene microcephala can usually be easily distinguished from its closest relative in the Kimberley region, *T. didiscoides*, but there is one somewhat intermediate specimen from Drysdale River National Park (*A.S. George* 13182) currently housed under the latter name. This specimen resembles *T. microcephala* in its involucral bract size and overall appearance but has less hairy petioles than other specimens, the upper leaves with cilia only towards the base as in *T. didiscoides*.

Trachymene villosa (F. Muell.) Benth. (Bentham 1867: 349). – *Hemicarpus villosus* F. Muell. (Mueller 1857: 18). – *Didiscus villosus* (F. Muell.) F. Muell. (Mueller 1859: 238). *Type:* Sturts Creek, [Northern Territory or possibly Western Australia], *F. Mueller* (K, *n.v.*).

Annual herb 0.2–1 m high; indumentum of long patent non-glandular hairs. *Stems* rather densely hairy throughout except for peduncles; hairs 4–7 mm long, slender. *Cotyledons* not seen intact. *Petioles* commonly 15–100 mm long, the longer hairs usually 3–4 mm long; expanded base not well differentiated. *Leaf blades* usually broadly to depressed obovate in outline and deeply divided or lobed, commonly 30–55 x 25–75 mm, the 3 primary lobes usually further trisected or bisected or dentate, hairy mainly along the main veins, the hairs shorter than on the stems. *Peduncles* commonly 50–150 mm long, rather densely hairy towards base but glabrous in distal half. *Involucral bracts* commonly 25–35; base *c.* 2 mm long; free portion commonly 8–11 mm long, glabrous. *Umbels* mostly 25–40 mm diam., usually over 100-flowered. *Pedicels* commonly 3–15 mm long; outermost ones usually 12–15 mm long in fruit, glabrous. *Petals c.* 1.3 mm long, pale to deep pink on undersurface, white or pale pink on upper surface. *Anthers c.* 0.4 mm long. *Fruit* highly bilaterally compressed, with the outer monocarp very reduced and commonly 1.3–1.7 mm long; largest sepal commonly 1–1.7 mm long; styles usually 2–2.5 mm long. *Fertile monocarp* broadly winged; body *c.* 3.5 x 2.5 mm, *c.* 0.5 mm thick, tuberculate; wing 2–3 mm wide, entire. (Figure 7E–G)

Specimens examined [precise localities withheld]. WESTERN AUSTRALIA: SE of Gordon Downs Station, 14 July 1949, *R.A. Perry* 2491.
NORTHERN TERRITORY: SW of Hookers Creek, 18 May 1971, *J.R. Maconochie* 1114.

Distribution. Occurs in the south-eastern part of the Northern Botanical Province. The only definite record for Western Australia is from south-east of Gordon Downs Station but the type specimen from Sturts Creek might also have been collected in this State. Also occurs in Northern Territory. (Figure 3)

Habitat. Recorded on skeletal soil over quartzite, with *Eucalyptus brevifolia* and *Triodia*.

Phenology. Flowering and fruiting period: May to July.

Conservation status. CALM Conservation Codes for Western Australian Flora: Priority One. There is only one definite record for Western Australia from about 50 years ago. *Trachymene villosa* is much more abundant in Northern Territory.

Notes. This species was omitted from "Flora of the Kimberley Region". In the key given in that flora (Wheeler 1992: 683), *T. villosa* would come out with *T. didiscoides* and *T. microcephala*, from which it can be distinguished by its conspicuous stem indumentum 5–7 mm long and its broadly winged monocarps.

T. villosa is not a typical member of sect. *Hemicarpus*, perhaps being the only strictly annual species included here, with petals larger than most and tending to be pink rather than yellow on the upper surface. Its affinities may lie more with species of other groups in Northern Territory or elsewhere. More work is required for the genus in the remainder of Australia and also overseas before the species groups can be determined reliably and a complete formal infrageneric taxonomy drawn up.

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